AMERICAN GAS JOURNAL

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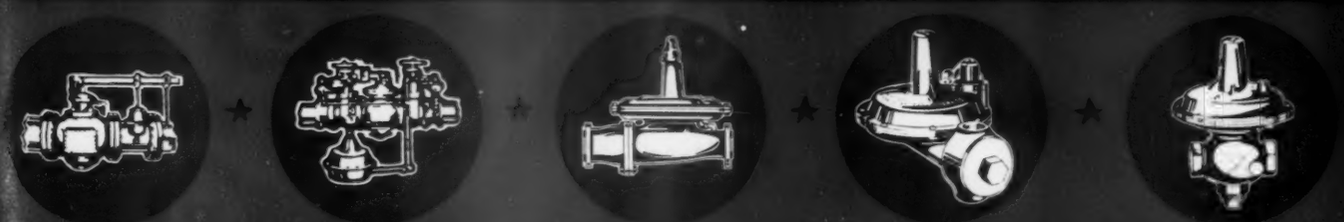

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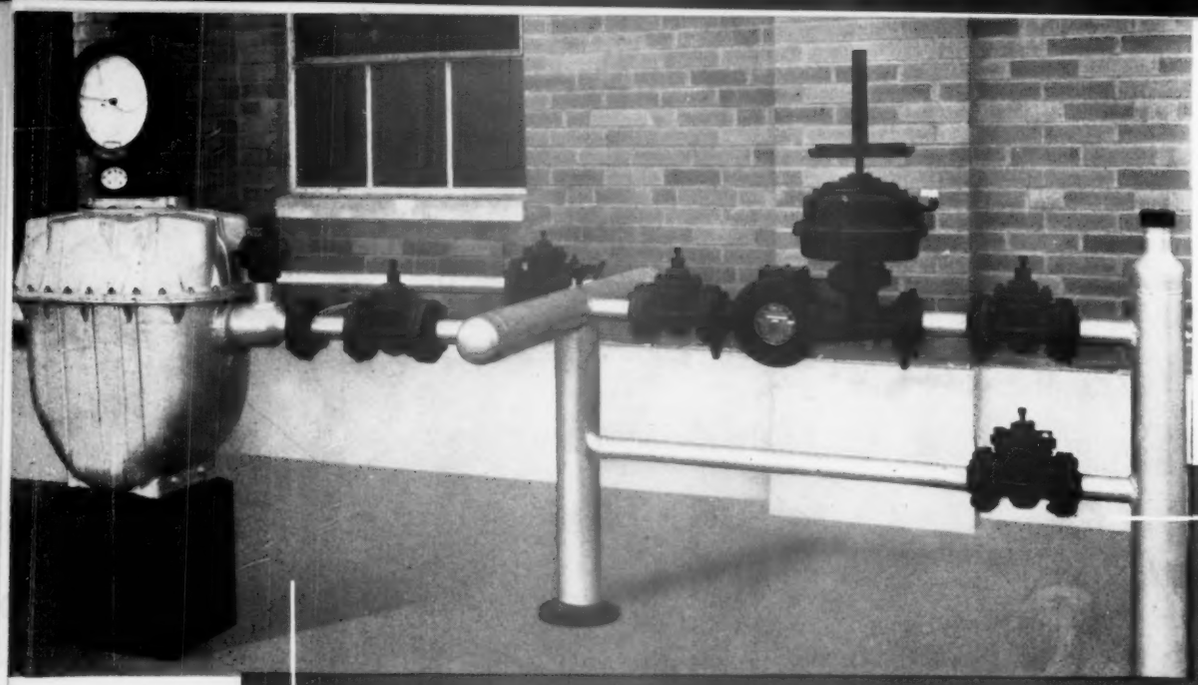

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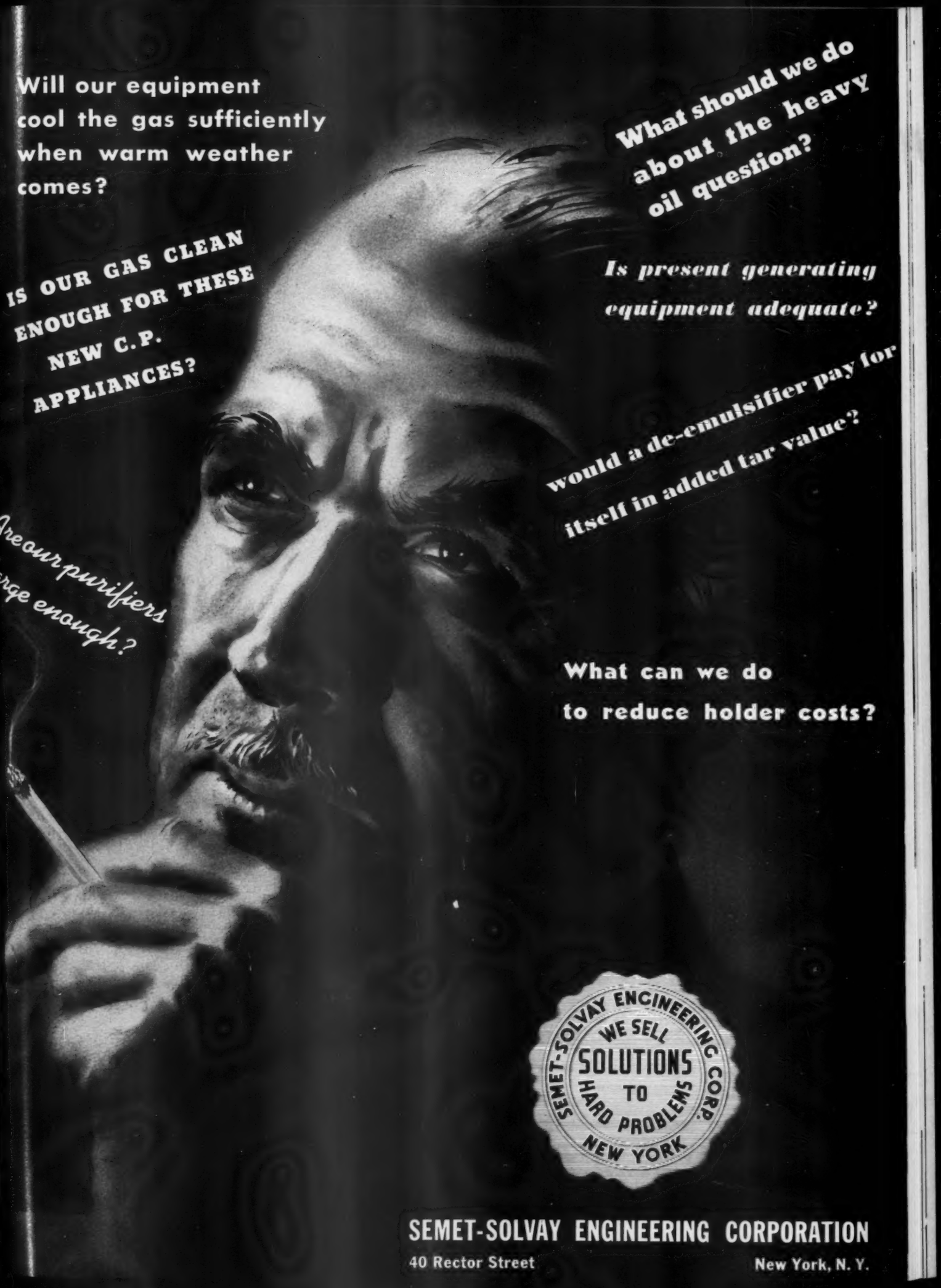
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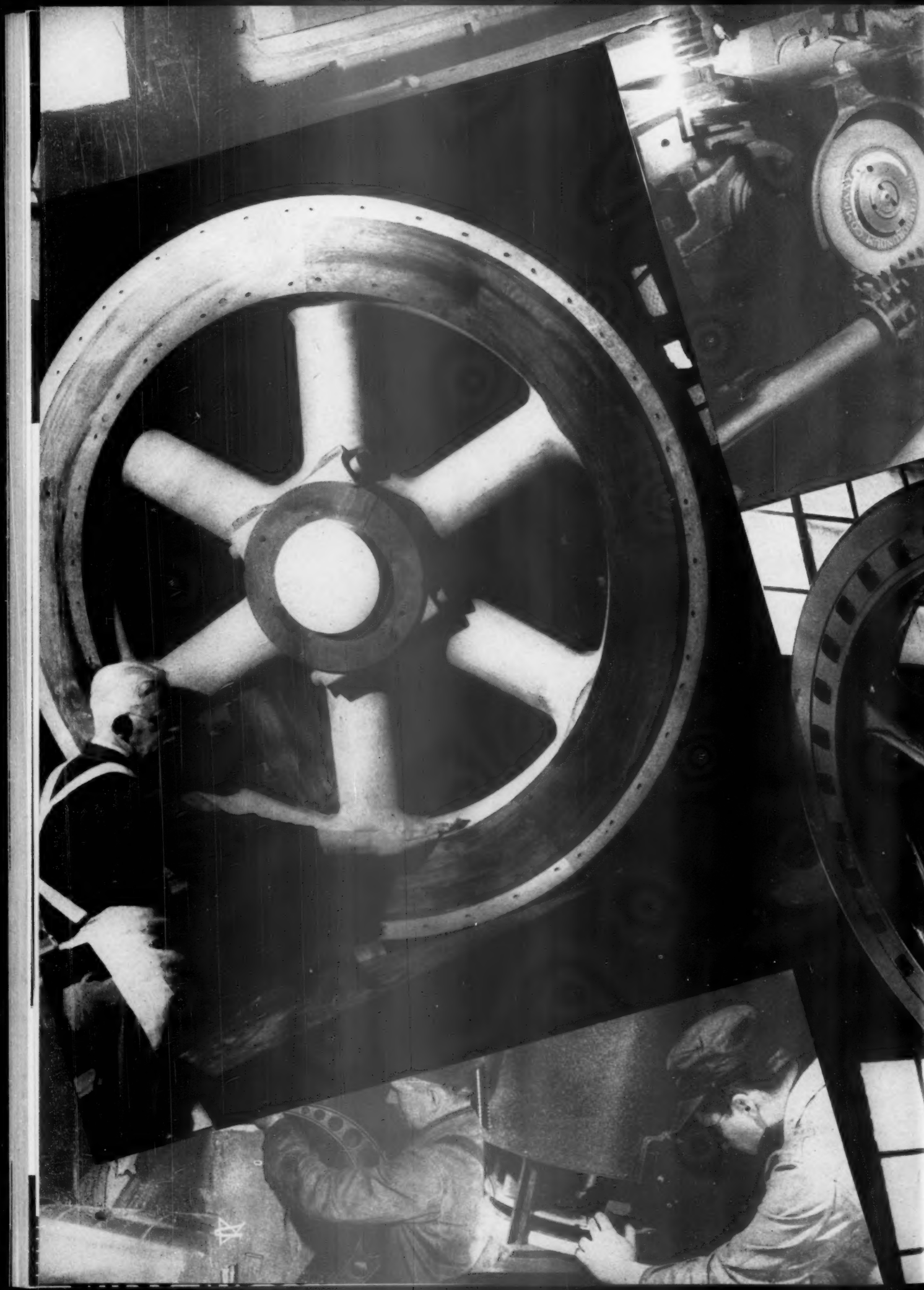

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AMERICAN
GAS JOURNAL

VOLUME 156
NO. 5

The Natural Gas Industry and the War

By
J. French Robinson
President
East Ohio Gas Company
Cleveland, Ohio

I HAVE BEEN ASKED by the Chairman of your Program Committee to discuss with you, for a few minutes, some of the natural gas industry's contributions to the war effort. You have heard from the previous speakers the important role that the oil industry is playing in this war. Oil is petroleum. Natural gas is a part of the petroleum industry.

J. French Robinson

The difference is one of the comparative refinement with which the two products issue from the ground. Gas needs virtually no processing or refining in its conversion to heat. It has been refined by nature. The refining of petroleum, of course, is man's work and a marvelous tribute it is to man's ingenuity. While the range of natural gas use is narrower than that of petroleum, it does have, however, a variety of uses other than its principal one of heat. Even these other uses of natural gas are blood brothers in chemistry with petroleum. The reasons for the prime importance of our twin industry are well known to us all, and I am glad to say that the public is at long last becoming familiar with these socially vital phases of petroleum and natural gas.

The reasons why the public has had so recent and rapid an education in our industry are, of course, the war and defense production. War teaches all of us many things which we did not know before, and war teaches fast. It is a harsh teacher, and, if it is not a very thorough teacher, it at least wastes no time and covers a lot of territory quickly.

This is a mechanized war, as we all know. Indeed, the sociologists tell us that not only are the products of our joint industry necessary to the prosecution of modern war, but that the sources of supply themselves were responsible for the present conflict. It has, however, long since spread much further than that, although it is notable that the fighting still seems to center around those few parts of the world which are dotted with drilling rigs. The reason for its being a mechanized war is, of course, that we live in an age of machinery. Machines do the work of men, even to their fighting. If we want to look for a little brightness in the picture, we can manage to see through the clouds of war, I think, the gleam of hope that machinery can do man's usefully constructive work just as well as his destructive work, and will again be doing it.

"The unique qualifications of natural gas heat makes it almost an essential in the processing of metals for war machinery. It all hinges of course on the extreme and easy controllability of gas heat by automatic means, its very wide range of temperature and its marvelous flexibility. Only in natural gas do we find all these virtues in such perfect combination."

At the present time our thoughts are of war, and of necessity must be. I can say as a matter of practical operating fact that the natural gas industry as a whole, and in all of its parts, is mobilized for war. As with oil, so with natural gas. In this war of machinery, planes, tanks, trucks, ships and so on—an almost endless list—are essential in ever increasing numbers. It is necessary, therefore, to construct this equipment and then to keep it moving. With natural gas, as with oil, there is a double responsibility. It is a responsibility expressed in the construction of war equipment and the responsibility of making it move and keeping it moving after it is constructed. You can say it all in three words, but the three words mean almost literally an entire world: gas heat processing . . . oil for lubrication . . . gasoline for power. The list of mechanized military functions is so long that I will try to say them all with one word and call them all the modern *enginery* of war. Ordnance itself in modern war would fill a book.

But it is mostly all machinery. It all has to be made. Most of it is made from metals. In the working of metals, heat is the prime agent, and when you say oil and natural gas you are saying *heat*. Of all fuels,

natural gas comes nearest to being perfect heat and pure heat—really requiring nothing to be done to it before—it is ready to use. It is this which explains the bearing of natural gas on our present war effort.

It is the marvelous and literally unique heating virtues of natural gas that give it preeminence over its other values in this present mechanized war effort. It is no accident which has made the Pittsburgh, Youngstown, Cleveland and Wheeling areas the mechanical heart of America at war. This is for the reason that the various metals, of which steel is only one, that go into the multitudinous machines of war,—planes, tanks, trucks, and all the rest of it,—are, for the most part, made and processed in this region. Natural gas plays a very important part in the use of metals for war at all its points, from its metallurgy through to the finished product. It plays, perhaps, its most important part in finishing the metals from which all kinds of parts are made. I say "finishing" in its highest technological sense, for the treatment of metals by means of heat has become a very exact science. Upon these heat treatments depend the accuracy and the life and the sure functioning of the precision mechanisms which are almost the brain of a modern machine, whether of peace or war.

There is the very widest imaginable range of uses for which natural gas and its accurate thermostatic control is vitally essential. Let me illustrate that range by saying that it begins, perhaps, with the processing of war steel for armor plate and includes the heat treatment of metals for the finishing of precision instruments. If it is a special purpose metal, it can be said almost with certainty that natural gas is essential to its processing at one, and often more than one, point.

I need not here go into the unique qualifications of natural gas heat which make it almost an essential in the processing of metals for war machinery. It all hinges, of course, on the extreme and easy controllability of gas heat by automatic means, its very wide range of temperatures and its marvelous flexibility. Some of these virtues are approximated by other forms of heat, but in only natural gas do we find all these virtues in such perfect combination. I might also say that the use of natural gas by scientifically controlled imperfect combustion, is useful not just as a form of heat but as an atmosphere other than air in certain heat treatment furnaces.

In the synthetic chemistry of war essentials, such as rubber, high explosives, etc., natural gas is necessary.

Natural gasoline, which, for the most part, is closely associated with natural gas, is also playing an important role in this war. The natural gasoline is used for fuel for tanks and automotive equipment, and from the natural gasoline butadiene and isobutane are extracted, both of which are essential in the making of 100 octane aviation gasoline and in the manufacture of synthetic rubber.

It is of interest to see what the natural gas industry is doing at the present time in the way of furnishing civilian needs and war needs as compared with normal times. Let us, therefore, study the situation in the Appalachian area, which is now classified by the Petroleum Coordinator's Office as District No. 1 in the United States. It embraces the states of New York, Pennsylvania, Ohio, West Virginia, and Kentucky. Following is the amount of natural gas consumed and, for the most part, produced in District No. 1 for the years, 1941, 1939, 1936, 1927, 1921, and 1916:

Year	*Domestic & Commercial Consumption*	*Industrial Consumption*	*Total*
	(All figures are millions of cubic feet)		
1941	187,903	219,327	407,230
1939	166,006	191,294	357,300
1936	164,484	183,867	348,351
1927	185,338	148,315	333,653
1921	180,773	136,610	317,383
1916	183,729	322,798	506,527

The natural gas demands are now some 20 per cent more than they were in 1921, 1927, 1936 or 1939, and are increasing day by day. They have not yet reached the all-time high for this District, which occurred in 1916 and amounted to 507 billion cubic feet. It must be remembered, however, that a great deal of the natural gas used at that time was consumed under boilers, etc., at a very low price; whereas now, nearly all of this gas is used for high-grade purposes, such as heat treating and processing of metals, and for any purpose where close controlled atmosphere or certain flame characteristics are demanded.

It is noticeable that the gas required for industrial purposes in 1921 was only 137 billion cubic feet, whereas in 1939 it was 191 billion, and in 1941 amounted to 219 billion cubic feet.

The industrial demands, as one can see, are increasing very rapidly, and just how much more our production and pipeline systems will stand is a question. I am sure all of us are now doing our best to meet all the requirements and will continue to do so.

When we speak of 407 billion cubic feet of natural gas, what are we talking about? Just what would it look like if we could see it? The heat equivalent in coal would amount to some 18 million tons, which is about 6 per cent of all the soft coal mined in this District during 1940. It would fill 360,000 hopper coal cars, or enough cars to make a train over 2,860 miles long. Converting the 407 billion cubic feet of natural gas into oil equivalent, we would have about 70 million barrels of oil—enough oil to fill over 280,000 tank cars, or 2,125 miles of tank cars. This is over twice as much oil as was produced in this area during 1940.

The natural gas requirements for District No. 1 for the first three months of 1942 are perhaps an all-time high for any period of three months in any previous year. The peak day requirement was in excess of 2 billions of cubic feet of gas. The natural gas reserves of District No. 1 or the Appalachian area are approximately 5¼ trillion cubic feet of gas. This represents about 7 per cent of the total natural gas reserves in the United States. Contrast this to our sales which represent about 14 per cent of all the gas sold in the United States. That is to say, we have 7 per cent of the natural gas and are selling 14 per cent of the natural gas in the United States.

It must be evident that we cannot do this for long. The annual sales as previously noted are now in the neighborhood of 410 billion cubic feet of gas. From these figures one might draw the conclusion that we have enough natural gas in the District for a 10 to 12 year supply. This, however, is not the case. The problem of meeting peak load demands has become very troublesome and would be a great deal worse if it

were not for the fact that large quantities of gas have been and are being stored in partially depleted gas fields located near markets where they can be drawn upon to help meet these peak demands. The critical problem in this District is the problem of getting the gas from the producing horizons. Production from the old wells is constantly declining and the average production from our new wells is so small that, even with an accelerated rate of drilling, we cannot stop our normal decline of production from all of our wells.

With the rapid depletion of the Oriskany sand gas field in southern West Virginia, the prospect of maintaining our present deliveries seems impossible unless we secure a supply of natural gas from without the Appalachian area.

The natural gas industry, in cooperation with various governmental agencies, is helping to solve the fuel problem. Our industry is represented on the Petroleum Industry War Council, working directly with the Petroleum Coordinator, Secretary Ickes, and assistants. This co-operating pertains to the production and production problems of our industry. Orders M-68 and P-98, with their respective amendments, are being worked out to the best advantage of the industry and our war efforts. We are also working in close harmony with the Office of the War Production Board, which deals with transmission and distribution problems of our industry. We are cooperating with them in all matters pertaining to Priorities (Order P-46) and restrictive orders (L-31). You are all aware of the problems involved by these various orders. When this war has been won I am sure the petroleum and natural gas industry will feel that it has done its full share and one that we can all be proud of in helping to bring about this victory.

For win the war we shall and will. I do not think that the war itself is fully charted as yet. It may be called in its development period. These matters are beyond our control and perhaps beyond the control of anybody, anywhere. The accident factor in war is great, and this is the initial period when accidents are of necessity the most frequent, the least preventable. I am pretty sure that Herr Hitler himself will bear me out in this.

The war is still, from a militaristic viewpoint and geographically, a huge sprawling thing. It is still sprawling and growing—and nobody knows where its tentacles will reach yet. In fact it is the business of war leaders to see that nobody does know. It is natural that they themselves be surprised sometimes.

But the war is crystal clear to us in the ways which affect us, and the ways by which we are supposed to affect the war. The military operations we must and can leave to those in charge of them, bending our efforts toward supplying them with the things they need. Operating the war is in the hands of the strategists and fighting forces. Operations behind the lines and the policies and strategies which make for the strongest possible country to withstand and win the war, are very distinctly our province. We literally make the country we are fighting for. It is our country and we intend to keep it—that is why we are at war.

I think it would be wrong to redesign a great industry for war work, as we have done and are doing, if we did not pay attention as we go along to the morale of ourselves and of others. We are told this daily and almsot hourly from Washington, and it is true. A word commonly used to describe that which we are warned against is "complacency." I do not think it is a good word, or that it describes, let alone defines, what it is used to designate. Some of our publicists and inspirational leaders call it "apathy," which is a very sinister word and does not apply at all. I do not believe that complacency is the right word, either, nor is another, still worse, which is sometimes used by our national leaders when they scold the masses of our people—after all, it is *their* country, too. That word is "defeatist," usually applied as the term "defeatist attitude." I don't think that thing exists.

Labels are tricky and dangerous things, and we can forget them. They are handy and convenient articles—too much so, for they are carelessly used. Forget the possibility of analyzing our American war spirit, and fitting a name to it, for no possibility exists. But there are certain facts which now concern the American people, which the people face and must see through to their final answers. And let us not forget that, however a few of us may generalize and spout words and weave figures of speech, it is the masses of common people who have to do the final answering. It's their war that they are asked to fight and pay for in blood and suffering. It is their country. Will *they* have a say as to the wars that they have to fight? Most certainly they will, and that is exactly why the propaganda department of a government at war is as important as any other. I use the word "propaganda" in its correct sense, of course. More politely expressed, as is the fashion, it is known as "popular education." A very wide and rubbery word, indeed, is "education," for we believe that our enemies teach their people only what is wrong—and they say the same of us—while we teach ours only what is noble and virtuous and true. But that's war. I can't change it, and you can't.

Sometimes I wonder what God might think of all this stuff his children go in for with such gusto. But I think you will agree with me in saying that God is very, very far aloof from this war. A properly reverent mind could imagine Him in no other attitude toward war. Certainly God could not be on all sides at once, and with equal zeal, as all sides insist He is.

I cannot get away from this subject of people in war—nor can our government or any other warring government get away from that subject either. We talk of, teach, and teach most correctly, that "oil is ammunition," and so it is, and also that "it is patriotic to use gas wisely." This is also true of aluminum and many other things. But I submit, gentlemen, that the real ammunition in a war is the people who have to do the fighting, and who pay for it with their lives, their tears, their suffering, the wreck of their present and the possible ruin of their future. And I submit as a vital, essential military fact—as pointed as any projectile we fire at an enemy—that the people who fight the wars have to have it very, very clearly in their minds just what they are being asked to fight for and how they can expect to bring that about. For, I take it, in a democracy such as it is the objective of our present war to preserve, the people are still *asked* to fight a war.

Anyway, let's be candid and say that they want to know, and are going to find out. A few broad and beautiful generalizations, in the best of toastmaster language, won't be the answers, either. It is a mistake to think otherwise. The aim in wars is to make as few mistakes as possible, and to make none that are preventable. To make mistakes in the mechanical ammunition of war is bad enough. To make mistakes in the processing of public opinon

(Concluded on page 60)

Modern New Orleans

Pirates' Alley in the heart of New Orleans' French Quarter runs along one side of the venerated Saint Louis Cathedral.

TWO CITIES IN ONE is New Orleans, combination of the new and the old, with the romance and glamour of old France and Spain merging with the hustle and bustle of progressive America.

On one side of Canal Street, widest and most beautiful business thoroughfare in this country, is the Vieux Carre, preserved practically as it was two hundred years ago. On the other is the business and financial section, a youthful enterprise compared with the age of the old city, yet established as the hub of southern business.

There is nothing incongruous about it to Orleanians, who know the story of how a great and progressive city grew from a small settlement in the marshes. Part of New Orleans' development into a modern city goes back into history. But in recent years, inhabitants have seen almost eight miles of wharves and steel and concrete transit sheds constructed along the shores of the Mississippi; have watched giant planes fly into an airport constructed where only ducks flew before; have seen a swampy lake shore reclaimed into several thousand acres of fine residential land; have crossed a majestic bridge over the Mississippi where many engineers said no bridge could be built; and have seen the mighty river, at flood stage, subside at the opening of a new man-made flood project. For all forms of development have taken place, as New Orleans grew from a small, antique community of half a hundred Frenchmen to the modern Crescent City of half a million Americans.

New Orleans' greatness is as well expressed by the monuments which she had built to progress as it is by industrial preeminence. Canal Street, which now runs where once was a deep drainage canal, is not only the most beautiful, but one of the best lighted business streets in the world. An efficient white-way lighting system makes the nights as bright as day, and illuminates the neutral ground and sidewalks, which are paved with terrazzo marble.

New Orleans Airport, built up from a morass by pumping the lake bottom in behind a concrete seawall, is only five miles from the business district, and forms a part of the new $40,000,000 New Orleans front yard constructed behind a five-mile seawall, along which runs a wide scenic highway. Landing accommodations and all other facilities are available at the field.

A dream of decades became a reality when the $13,000,000 toll-free Mississippi River bridge was constructed, a direct outlet to the west for rail, highway and pedestrian traffic. Such a bridge was for a long time believed impossible because of the difficulties entailed in finding foundation, but the central pier finally found solid bottom 170 feet below Gulf level. Its total height, to the top of the superstructure, is 409 feet, equal to that of a 36-story building. From 200 to 1000 men worked on the construction, over a period of three years, finally completing the 4.4 miles structure.

Probably the most important of recent projects is the monumental Bonnet Carre Spillway, which offers further security for the city from the flood waters of the Mississippi. Although the levees of the city have not been overtopped for 100 years, the Spillway offers protection, for located 35 miles above the city it removes flood crests before they become dangerous. By opening the Spillway, the high waters are diverted through a shallow basin into Lake Pontchartrain, thence out into the Gulf. The Spillway was opened for the first time in February, 1937, and proved its efficiency by lowering the river level at New Orleans several feet. At full capacity it can handle more water than flows over Niagara Falls.

Among the other modern achievements of New Orleans is Charity Hospital, which in medical circles is considered as one of the modern wonders of the world; the new Federal Building and the Southern Regional Research Laboratory which is endeavoring to find new commercial uses for the agricultural products of the South. The national defense program is resulting in the construction of many important buildings in New Orleans, such as a thousand bed army hospital, a large army bomber unit, naval air training base and a coast guard training station.

Canal Street in New Orleans is America's widest business thoroughfare and it is the dividing line between the old city and the new. It is 171 feet wide. The neutral ground and sidewalks are paved with marble with deep pink borders.

Measurement of Industrial Gas By Displacement Meters

By
John C. Diehl
Chief Engineer
American Meter Company

JOHN C. DIEHL

OUR WAR EFFORT has been greatly enhanced by increased knowledge in the use of gas. Through the cooperation of the gas industry and the gas equipment manufacturers, superior industrial methods have been developed since the first World War. These developments have given us better steels, bronzes, and metals for particular purposes. They are often made in inert ovens which permit the maintenance of bright surfaces of metals and a reduction of surface oxides; they prevent decarburization or softening of the metal surfaces. Carburizing furnaces have been developed for hardening metal surfaces which use gas not only as a source of heat, but as a hardening agent, all of which means superior metals at less cost. It is estimated that the heating cycle required for the manufacture of a tank has been reduced from approximately 500 hours to 100 hours through the use of gas as a means of case hardening outside surfaces. These examples illustrate the tremendous strides that have been made. The present consumption of commercial and industrial gas is treble that of 1919.

Not many years ago, the rate at which gas was used was determined by a valve opening of so many spokes, but the day of the cookbook recipe of "a pinch of this and a dash of that" has been supplanted by more exact formulas, eliminating the personal factor which existed in many industries during the previous war.

For the manufacture of metals having rigid specifications for particular purposes, careful measurement is required. It is only because of the installation of many measurement instruments that it is possible to meet the exacting specifications of present-day manufacture.

Displacement Meters. In the measurement of industrial gas, the large displacement meter fills a definite field, especially for plant and departmental measurements. Many large tinned steelcase meters are used. These meters are of the type generally installed by the manufactured gas companies for commercial measurement, and are used by that branch of the industry because of their relatively slow motion and lesser weight for the same capacity at low differentials.

In those locations where the space is limited, or the gas is distributed under high pressure, or where a more rugged type of meter is desired on account of lack of protection, the large iron meters are used. Although these are higher-speed meters, their performance is excellent because they are assembled with special bearings and heavier parts to withstand the greater stresses to which they are subjected. These meters are used extensively for measuring gas at a vacuum or at pressures up to 250 pounds. The size of meter which should be installed depends upon the "open capacity" of the meter, the rate of flow, and the density of the gas.

Open Capacity. The "open capacity" is the quantity of gas (specific gravity 0.6) which will pass through the meter at atmospheric pressure when the differential (drop in pressure between the inlet and the outlet) is two inches of water. The term "open capacity" in this paper is used for the gas rate at two inches differential to distinguish it from the "rated capacity" which, for low pressure meters is the quantity of gas which passes through the meter at atmospheric pressure, when the differential is ½ inch of water.

The density depends upon the pressure, the specific gravity, and the temperature of the gas in the meter. In most instances the specific gravity is near 0.6, the temperature is assumed to be 60 degrees F., on the average, so that these factors, specific gravity and temperature, are not considered except when their values are much higher or lower than the preceding values.

Capacity vs. Pressure. The effect of pressure and rate of flow through a displacement meter can be best explained by examples, in Tables A to D. A slight pressure of approximately 0.1 inch of water is required to overcome the friction and start a flow through the meter. As the rate of flow increases, the differential created by the flow of gas through the ports and passages of the meter increases as the square of the rate of flow. For example, if the "open capacity" of a meter is 1,000 cubic feet an hour, that is, it will pass 1,000 cubic feet of gas at two inches differential, the drop in pressure due to friction is 0.10 inch and the drop in pressure due to flow of gas is 1.90 inches, or a total drop of 2.00 inches. If the rate of flow is increased to 2,000 cubic feet an hour, the drop in pressure will be 0.10 inch for friction and four times 1.90 inches, or 7.60 inches due to flow, for the reason that when the flow is doubled, the differential due to flow is quadrupled. At 2,000 cubic feet an hour the total differential is 7.70 inches. These facts are given in Table A.

TABLE A - EFFECT OF CHANGE OF INDEX RATE, CONSTANT PRESSURE
OPEN CAPACITY 1,000 CUBIC FEET AN HOUR

Gage pressure pounds	Pressure pounds absolute	Index rate cubic feet an hour	Cubic feet 14.73 lbs absolute	Differential Inches of water		
				Friction	Flow	Total
0	14.73	500	500	0.10	0.47	0.57
0	14.73	1000	1000	0.10	1.90	2.00
0	14.73	1500	1500	0.10	4.27	4.37
0	14.73	2000	2000	0.10	7.60	7.70
0.	14.73	2500	2500	0.10	11.87	11.97
0	14.73	3000	3000	0.10	17.10	17.20

TABLE B - EFFECT OF CHANGE OF PRESSURE, CONSTANT INDEX RATE
OPEN CAPACITY 1,000 CUBIC FEET AN HOUR

Gage pressure pounds	Pressure pounds absolute	Index rate cubic feet an hour	Cubic feet 14.73 lbs absolute	Differential Inches of water		
				Friction	Flow	Total
0	14.73	1000	1000	0.10	1.90	2.00
15	29.73	1000	2018	0.10	3.83	3.93
30	44.73	1000	3037	0.10	5.77	5.87
50	64.73	1000	4394	0.10	8.35	8.45
100	114.73	1000	7789	0.10	14.80	14.90
200	214.73	1000	14578	0.10	27.70	27.80

TABLE C - CHANGING PRESSURE AND INDEX RATE, CONSTANT DIFFERENTIAL
OPEN CAPACITY 1,000 CUBIC FEET AN HOUR

Gage pressure pounds	Pressure pounds absolute	Index rate cubic feet an hour	Cubic feet 14.73 lbs absolute	Differential Inches of water		
				Friction	Flow	Total
0	14.73	1000	1000	0.10	1.90	2.00
15	29.73	703	1421	0.10	1.90	2.00
30	44.73	574	1743	0.10	1.90	2.00
50	64.73	477	2096	0.10	1.90	2.00
100	114.73	358	2791	0.10	1.90	2.00
200	214.73	262	3818	0.10	1.90	2.00

TABLE D - INCREASING PRESSURE, DECREASING INDEX RATE, INCREASING DIFFERENTIAL
OPEN CAPACITY 1,000 CUBIC FEET AN HOUR

Gage pressure pounds	Pressure pounds absolute	Index rate cubic feet an hour	Cubic feet 14.73 lbs absolute	Differential Inches of water		
				Friction	Flow	Total
0	14.73	1000	1000	0.10	1.90	2.00
15	29.73	839	1693	0.10	2.70	2.80
30	44.73	758	2301	0.10	3.31	3.41
50	64.73	691	3035	0.10	3.98	4.08
100	114.73	599	4663	0.10	5.30	5.40
200	214.73	512	7461	0.10	7.25	7.35

In Table A the gas is measured at low pressure, and in each instance the rate in cubic feet at standard conditions (14.73 pounds absolute) is the index rate. However, if the index rate remains constant and the pressure increases, the differential due to flow will increase as the absolute pressure increases. For example, if at low pressure (14.73 pounds absolute) the meter operates at a rate of 1,000 cubic feet an hour with a differential loss of 2.00 inches of water, 0.10 inch being due to friction and 1.90 inches being due to the drop in pressure through the ports and passages of the meter, then if the absolute pressure is increased from 14.73 pounds to 64.73 pounds or 4.394 times, the differential due to flow is increased 4.394 times ($1.90 \times 4.394 = 8.35$) and the drop in pressure through the meter will be 0.10 inch for friction and 8.35 inches for flow, or a total of 8.45 inches of water. These effects are shown in greater detail in Table B.

When measuring at or near atmospheric pressure, large capacity meters are usually installed to operate at a maximum differential of two inches of water. If it is desired to use the meter so that the maximum differential pressure should not exceed two inches of water at higher pressures, the index rate should vary inversely as the square root of the absolute pressure. At constant differential the capacity at standard conditions (14.73 pounds absolute) varies directly as the square root of the absolute pressure. Table C contains examples.

In Table C it will be noted that the index rate drops very rapidly as the pressure increases, and that the capacity at standard conditions increases very slowly as the absolute pressure increases.

Table D shows the effect of decreasing the index rate, not so rapidly as in Table C, but in such manner that the differential produced by the flow varies as the square root of the absolute pressure. The values of the index rates, quantities at standard conditions, and differentials due to flow, in Table D, are the products of the square roots of the same items for the corresponding pressures in Tables B and C. For example, at 100 pounds pressure, the index rate 599 in Table D is equal to the square root of the index rate 1000 in Table B multiplied by the square root of the index rate 358 in Table C. ($599 = \sqrt{1000 \times 358}$).

Tables E and F give the recommended maximum index rates and capacities of several sizes of meters at various pressures. These values have been compiled from data based upon tests and performance of meters for many years. The values are similar to those of Table D.

Restricting Orifices. Especial attention is called to the use of displacement meters on high-pressure lines. When a valve is abruptly opened, permitting high-pressure gas to enter the meter suddenly, or gas which is under compression in the meter to leave the meter suddenly, the increased velocity may damage the working parts of the meter.

In some cases meters have been badly damaged by blowing drips on the outlet side of the meter. A sudden reduction in pressure due to blowing the drip reduces the pressure in the line and consequently increases the velocity through the meter.

To reduce the probability of injury to high-pressure displacement meters by the sudden opening of a valve by persons not familiar with the damage which may result, it is suggested that orifices be placed in the line so that the maximum rate of flow may be limited to twice the recommended maximum capacity of the meter under the most adverse conditions. Orifices similar to those of the following table have been used with success by a number of companies. It is not always advisable to install orifices with high-pressure meters, but there are instances when they should be used with meters measuring gas through lines equipped with intermittent on-and-off controls.

Open Capacity of meter	*Diameter of orifice Inches*
900	0.38
1500	0.48
2000	0.56
2500	0.62
6000	0.96
10000	1.23

The only disadvantage in using these orifices is that they will reduce the pressure in the line by approximately four percent of the gage pressure when measuring the maximum rate of flow recommended for the meter. For example, if an orifice having an internal diameter of 0.62 inch is placed in a line at the outlet of a meter (open capacity 2500 cubic feet) the maximum quantity which can pass through this orifice will permit an index rate of 5,000 cubic feet an hour at line pressure. At the recommended maximum rate for a meter measuring at 50 pounds pressure, the loss through the orifice will be 1.9 pounds.

In installations where meters are set in parallel, to prevent one meter from taking all of the load while the other meter fails to register due to slightly different friction losses in the settings, it is recommended that orifices having similar diameters be installed ahead of each meter, and that the total length of piping from junction to junction of the main line across the meter shall be approximately the same for each meter, so that the friction drop through the piping connections for each meter shall be the same.

Open Capacity of Meter	*Diameter of Orifice*
900	0.875
1500	1.125
2000	1.250
2500	1.375
6000	1.875
10000	2.250

Testing High Pressure Meters. High pressure displacement meters may be tested by the following methods:

1. Bell prover.
2. Test meter, diaphragm type.
3. Low pressure flow prover.
4. Critical flow prover.

All of these methods when used under proper conditions will give similar results. The high pressure meters are tested at low pressure at the same rates as low pressure large capacity meters; that is, at a check rate of about 10 percent of the open capacity of the meter, at some intermediate rate, and at a high rate in which the differential should be equal to or greater than the maximum differential produced by the flow of gas through the meter at the maximum load in service. For example, if the maximum differential produced by the flow of gas through the meter in service is 1½ inches of water, the inlet pressure at the meter under test should be at least 1½ inches when the outlet is open to the atmosphere. Numerous tests have indicated that the proof of a meter is the same for conditions which produce the same differential. For example, if a meter is tested at a rate of 1,000 cubic feet an hour by using air, the proof will be the same as if the meter were tested at a rate of 1300 cubic feet of gas (specific gravity 0.6) per hour for the reason that the differentials in both instances would be the same.

Referring to Tables D and A, which give data for a meter having an open capacity of 1,000 cubic feet an hour; in Table D at 50 pounds gage pressure and an index rate of 691 cubic feet an hour, the differential is 4.08. In Table A, at a gage pressure of zero pounds at an index rate of 1500 cubic feet an hour, the differential is 4.37; at a rate of 1400 cubic feet an hour at atmospheric pressure, the differential will be 4.08. Consequently, the proof of the meter will be the same under the two conditions when the differentials are 4.08.

The following table gives the test rates at atmospheric pressure for meters used at various index rates at various pressures. In this table the test rate at atmospheric pressure produces the same differential as the index rate at the pressure in the caption of the table.

Table E.

RECOMMENDED MAXIMUM INDEX RATES IN CUBIC FEET AN HOUR
VOLUME AT LINE PRESSURE; SPECIFIC GRAVITY, 0.6*

Pressure in pounds	Open Capacity of Meter						
	600	1000	1500	2000	2500	6000	10000
0	600	1000	1500	2000	2500	6000	10000
5	560	930	1400	1860	2320	5600	9300
10	530	880	1320	1760	2200	5300	8800
15	500	840	1260	1680	2100	5000	8400
20	480	810	1210	1610	2020	4800	8100
30	450	760	1140	1520	1900	4500	7600
50	410	690	1040	1380	1730	4100	6900
75	382	640	960	1270	1590	3820	6400
100	360	600	900	1200	1500	3600	6000
150	328	550	820	1090	1370	3280	5500
200	307	510	770	1020	1280	3070	5100
250	292	490	730	970	1220	2920	4900

Table F.

RECOMMENDED MAXIMUM CAPACITIES IN CUBIC FEET AN HOUR
VOLUMES AT 14.73 POUNDS ABSOLUTE; SPECIFIC GRAVITY, 0.6*

Pressure in pounds	Open Capacity of Meter						
	600	1000	1500	2000	2500	6000	10000
0	600	1000	1500	2000	2500	6000	10000
5	750	1250	1870	2490	3120	7500	12500
10	880	1480	2210	2950	3690	8800	14800
15	1020	1690	2540	3390	4230	10200	16900
20	1140	1900	2850	3810	4760	11400	19000
30	1380	2300	3450	4600	5800	13800	23000
50	1820	3040	4600	6100	7600	18200	30400
75	2330	3880	5800	7800	9700	23300	38800
100	2800	4700	7000	9300	11700	28000	47000
150	3670	6100	9200	12200	15300	36700	61000
200	4500	7500	11200	14900	18700	45000	75000
250	5200	8700	13100	17500	21800	52000	87000

*Specific gravity	Multiply by
0.45	1.15
0.60	1.00
1.00	0.78
1.20	0.71

TABLE G

Test Rates At Atmospheric Pressure

The index rate in cubic feet an hour in the first column is the maximum index rate of the field meter when in service. The test rates expressed in cubic feet an hour are not affected by the specific gravity if meters are tested with gas. If the meters are tested with air at atmospheric pressure, the values in the table should be multiplied by 0.78 if the specific gravity of the gas is 0.6.

Maximum index rate of field meter	*Pressure in pounds gage at which maximum index rate is measured by field meter.*								
	0	5	10	20	30	50	100	150	200
600	600	690	780	920	1050	1260	1670	2000	2290
800	800	930	1040	1230	1390	1680	2230	2680	3100
1000	1000	1160	1300	1540	1740	2100	2790	3300	3800
1500	1500	1740	1940	2300	2610	3100	4200	5000	5700
2000	2000	2320	2600	3100	3500	4200	5600	6700	7600
3000	3000	3500	3900	4600	5200	6300	8400	10000	11500
4000	4000	4600	5200	6200	7000	8400	11200		
6000	6000	6900	7800	9200	10500	12600			
8000	8000	9300	10400	12300					
10000	10000	11600							

For example, if the index rate is 1,000 cubic feet an hour and the pressure is 30 pounds, the same differential will be produced by that meter at an index rate of 1740 cubic feet an hour when gas is passed through the meter at atmospheric pressure. Or, if the index rate is 1500 cubic feet an hour and the pressure is five pounds, the same differential will be produced when gas is passed through the meter at atmospheric pressure at an index rate of 1740 cubic feet an hour.

Large iron meters used in manufactured gas installations and where the rate does not exceed the capacity at ½ inch differential, are usually tested at maximum periods specified by the State Commissions. When these meters are used under high pressure at the recommended rate, or at a rate which produces two inches differential at atmospheric pressure, they are quite frequently tested at periods depending upon the amount of gas which has passed through the meter. The larger meters are tested more frequently than the smaller meters.

Bell Type Prover Method. Large capacity high pressure meters are tested in the shop with a bell type meter prover by following the same procedure as used in proving low pressure meters. However, they should be tested at the rates mentioned in the preceding table. In some instances it may be necessary to put weight on the bell of the prover in order to increase the index rate so that the rate of flow will be sufficient to reproduce the differential conditions which exist in service. Decreasing the counterweight on the prover, or adding weight to the bell, may decrease the usable volume of the prover, and care should be used to be sure that liquid in the prover will not be lost by air flowing under the bottom edge of the bell when the bell is raised. Some provers are equipped with deep bells which will seal for eight inches of water pressure in the raised position.

Test Meter Method. The test meter or meters are correctly adjusted in the shop, taken to the location and connected by a short hose in series with the field meters which are to be tested. In some instances it is necessary to connect the outlet of the test meter to the line so that gas may not be wasted.

The size of the test meter should be at least equal to the size of the field meter, or a sufficient number of test meters should be connected in parallel and the parallel installation connected in series with the field meter so that it can be tested at the maximum differential produced by the flow of gas when in service. The proper test rate can be determined from the preceding Table G.

Low Pressure Flow Prover. Referring to Table G and the preceding description, if the maximum index rate in service is 5,000 cubic feet an hour and the pressure is 30 pounds, the meter should be tested at a rate of 5200 cubic feet an hour when using gas or approximately 4100 cubic feet an hour if using air. In some installations the flow prover is connected in the line at the outlet of the meter, with the downstream section of the prover connected to the line to the burner. In such an installation the flow prover differential is obtained between the tap on the upstream side of the orifice and a tap at eight diameters downstream from the orifice. Special tables are available for the determination of the proof on account of higher pressure at the downstream tap of the prover. Some companies are using a low pressure flow prover in their shops for testing. A small portable blower which, with its motor weighs about 120 pounds, is used for blowing air at eight to ten inches pressure through the meter. This blower can be used for testing with air on location and avoids the hazard of wasting gas.

In other installations in field testing, the meter is maintained under pressure and a valve reduces the pressure between the outlet of the meter and the Low Pressure Flow Prover. This type of testing permits the operator to test the meter under working pressure conditions, but it requires exact pressure measurements and the calculations are more involved. A sufficient length of pipe should be installed between the valve on the outlet of the meter and the low pressure flow prover to eliminate excessive swirls and eddy currents.

Critical Flow Prover. The critical flow prover may be utilized for testing positive displacement meters at pressures of 15 pounds gage or more, by passing gas or air through the meter and the orifice and discharging into the atmosphere.

The meter can be tested under working pressure conditions from a very low rate of flow up to the maximum rate at which the meter operates in service.

Some companies which have high pressure air lines and a sufficient air compressor capacity use the critical flow prover method for testing meters in the shop.

The outlet flange of the prover is threaded for a two-inch pipe connection. A hose may be connected to the outlet to transmit the gas to a point where it can be discharged without danger.

Pressure Devices. The most simple method for applying the pressure factor to the reading from a meter under high pressure is the compensating index. This type of index is used when the pressure is maintained at a constant value by a regulator. The index is assembled with a special dial, the face of which bears a notation that it is a compensating index. Special indexes which can be read to the nearest cubic foot instead of the nearest hundred cubic feet are available for test purposes. Direct reading indexes are desirable when the readings are obtained at frequent intervals in industrial plants. The direct reading index can be read more easily than the pointer type index by those who are not familiar with indexes.

Various types of volume and pressure recording gages are used for recording the changes in rate of flow and change in pressure. Pressure and temperature integrators automatically apply the factors to convert the volumes from line conditions to standard conditions. These instruments, which may be attached to the displacement meters, are described in the following paragraphs.

Volume and Pressure Gages. The pressure, volume, and time records enable the operator to apply the proper pressure factor to each unit of volume determined from the record made by the volume hand on the edge of the chart. It is possible to tell when the peak load occurs, for the chart is rotated by a clock. A volume and pressure gage rotated by the index of the meter is a most satisfactory instrument for recording the pressure, for the charts need be removed only once a month. The pressure factor can be obtained more easily from an index-driven chart than from the chart rotated by a clock.

Pressure Integrator. The pressure integrator has two indexes, one of which gives the reading of the actual quantity of gas passing through the meter at line pressure. Each 100 cubic feet of gas is multiplied by the pressure factor which applies for the line pressure and the base pressure. The products are totalized on the second index which registers the reading in cubic feet at the base pressure.

Pressure and Temperature Integrator. With this type of index each hundred cubic feet of actual volume at line temperature and pressure is multiplied by the temperature factor which applies for the line temperature and the base temperature, and then by the pressure factor which applies for the line pressure and base pressure. This device registers a totalized reading of the quantity of gas passed through the meter, in standard cubic feet at base pressure and base temperature.

Improvements in Displacement Meters. Among the many improvements in displacement meters, mention may be made of the use of Bakelite valves, roller bearings and lubricated bearings. The Bakelite valve has proved especially advantageous because it is of light material, dissimilar to that of valve seats, thereby eliminating noise which might occur at valves and providing a positive seal for a longer period of time. Bakelite valves are a further benefit in the present emergency, since their use releases a large amount of tin-base metals which were formerly used in valve construction. Large meters are subject to heavy loads. Lubrication of bearings and the extended use of roller bearings have proved of material benefit in reducing the initial friction of such meters. They increase the life of the bearings, and reduce wear and consequent play at joints.

Displacement Meter Features. The displacement meter has the following inherent desirable features:

1. It will not be damaged by a temporary uniform overload, even though the differential is greatly in excess of the maximum recommended differential, for the reason that the difference in pressure between the two sides of the measuring diaphragm under operating conditions is not in excess of ¼ inch of water pressure.
2. A desirable characteristic is the tendency of wear in one part to offset wear in another part of the meter. Wear at the tangent post, at the flag arm joints, or in the diaphragm disc connections produces a fast tendency which is offset by the slow tendency created by wear at the crank and valve wrist joints with the valve arm. At ordinary rates of flow, these opposing tendencies practically offset one another.
3. It measures all of the gas accurately from a practical minimum of 1/30 percent of its maximum capacity, up to the maximum capacity.

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The M-Scope consists of two specially designed radio units: A transmitter and a receiver. In operation, the transmitter sends out a continuous signal, and when there is no metal interposed between the two units, a definite volume of sound is heard in the earphones of the receiver. A meter mounted on the receiver gives a definite reading. If a metal object lies between the two units, the sound heard in the earphones will be louder and meter reading higher.

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Pipe Line Equipment

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Arc Welding Around The Gas Plant

By A. F. Davis
Vice President
The Lincoln Electric Company
Cleveland, Ohio

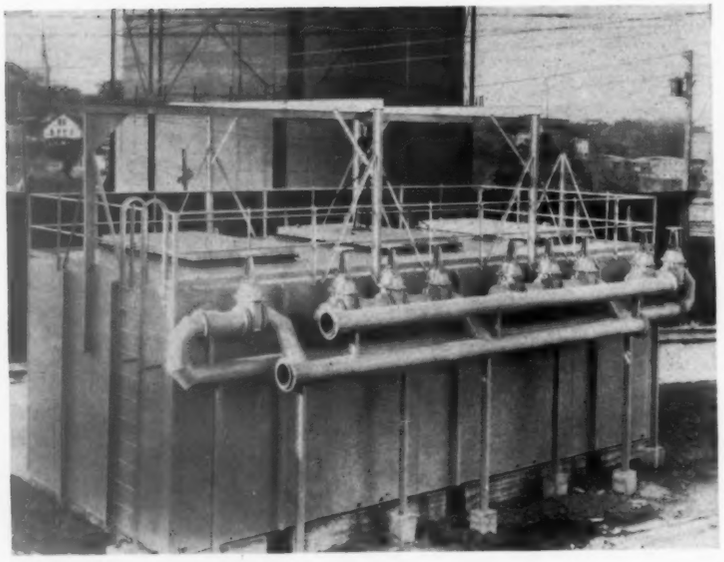


Fig. 1:—Purifiers constructed of arc welded steel.

AMERICA'S GAS COMPANIES are using their collective inventive genius in making use of one of the most potent means of servicing existing equipment and actually constructing new equipment. We refer to employment of modern arc welding.

Arc welding, as it is of service to gas companies, may be divided into three classifications: 1. New equipment of arc welded construction. 2. Maintenance of broken and worn equipment, and miscellaneous fabrication. 3. Erecting miscellaneous structures and structural parts.

New equipment which has been built by arc welding is invariably more rigid, practically impossible to break, and usually of smaller size which has the big advantage of aiding plant layout, due to less floor space being required.

Such arc welded equipment is familiar to every gas plant official. For example, Fig. 1 shows a group of purifiers constructed of arc welded steel for use in the manufacture of city gas. Similar typical welded equipment includes: reversing valves used on carbureted water gas equipment, water gas generators, regulators, rotary forging furnaces with arc welded water seals and syphon vents, and blast gates. All of this original equipment is stronger, more durable and lighter weight than it could possibly have been without the aid of modern arc welding.

Fig. 2:—Repair of worn part by arc welding cost only $1.50 — took 5 minutes!

The second classification, comprising the maintenance of equipment is probably equally important as applies to the needs of the gas industry today, for here is where the pinch of hard-to-get replacement parts hits the heaviest. To avoid generalizing, let's observe some specific examples.

In Fig. 2, a worn part, a bronze water-resisting pump is shown being made ready for arc welding which will correct or "build up" the pitted area, marked in chalk. Replacement cost of this part would be $44.00! Welding time is 5 minutes; cost about $1.50!

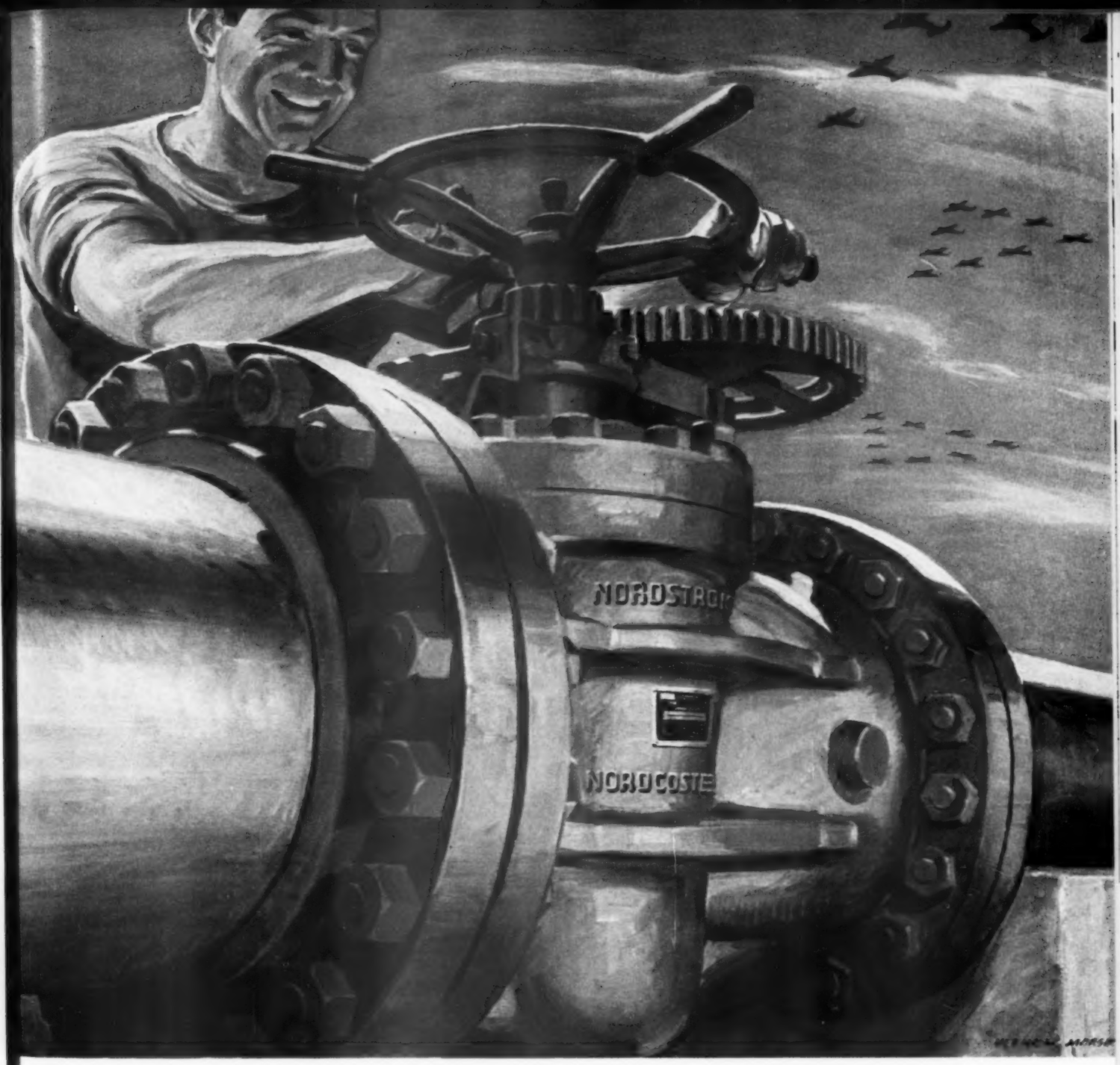
Lincoln "Aerisweld" electrode was used to build up this pitted area. "Aerisweld" is a shielded arc type electrode used mainly for welding bronze, brass, and copper in its many applications. Many types of bronze that are difficult to braze are easily welded with "Aerisweld." The deposit is a dense, high-strength one with characteristics of true phosphor bronze.

Fig. 3 shows a shaft that cost $60 when new, and due to severe service, must be repaired frequently. In making the welded repairs, that shaft is machined off radius 1/32" to remove worn spots. It is then placed in a turning jig and built up by the application of weld metal. Time, only 5 hours! Cost, a fraction of replacement.

Fig. 4 shows arc welding applied to building up a corrosion resistant impeller. A shaft has been worn from contact with packing. It was built up with 1/8 inch "Stainweld A-5" electrode, then machined to proper dimensions. Replacement cost of part would be about $40—welded repairs cost only $3, plus 30 minutes of welding time!

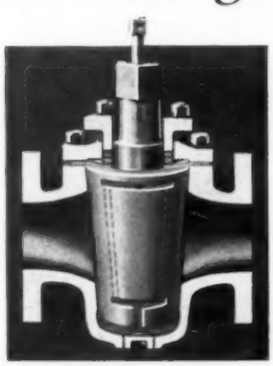
Lincoln "Stainweld A-5," employed on this job, is most used in shielded arc welding of 18-8 stainless steels and for re-surfacing. It is also used in providing protective overlay to many types of steel and for welding high manganese steel, where strength is the paramount factor. Its advantage is that it produces dense welds with corrosion resistance equal to, or greater than that of the parent metal. Furthermore, the weld can be ground or polished with perfect results.

Fig. 5 shows arc welding used for strengthening cast iron columns. Four of these columns had to be made stronger to support the weight of some new machinery. Here was the procedure: they used 18-inch steel pipe, split it longitudinally and encircled the old columns by welding the two halves together with "Fleetweld" electrodes. They then filled the space between the pipe and the old column with concrete. In the background is shown some of the steam and water piping that the plants' maintenance department has welded.



The *Strongest* Line of Defense against Leakage

Selection of Nordstroms is an engineering axiom for defense against leakage. The majority of main gas transmission lines installed during the last five years are Nordstrom-controlled. The same is true in the case of refineries. Every leading recycling plant relies on Nordstroms for important line control. In every high pressure oil drilling field there's a regiment of Nordstroms—particularly Hypreseals on mud lines where valve cutting takes heavy toll in ordinary valves. Check the principal chemical plant installations and there again it's a Nordstrom victory, for Nordstroms fully defend themselves against corrosion, erosion, extremes in temperature and pressure.



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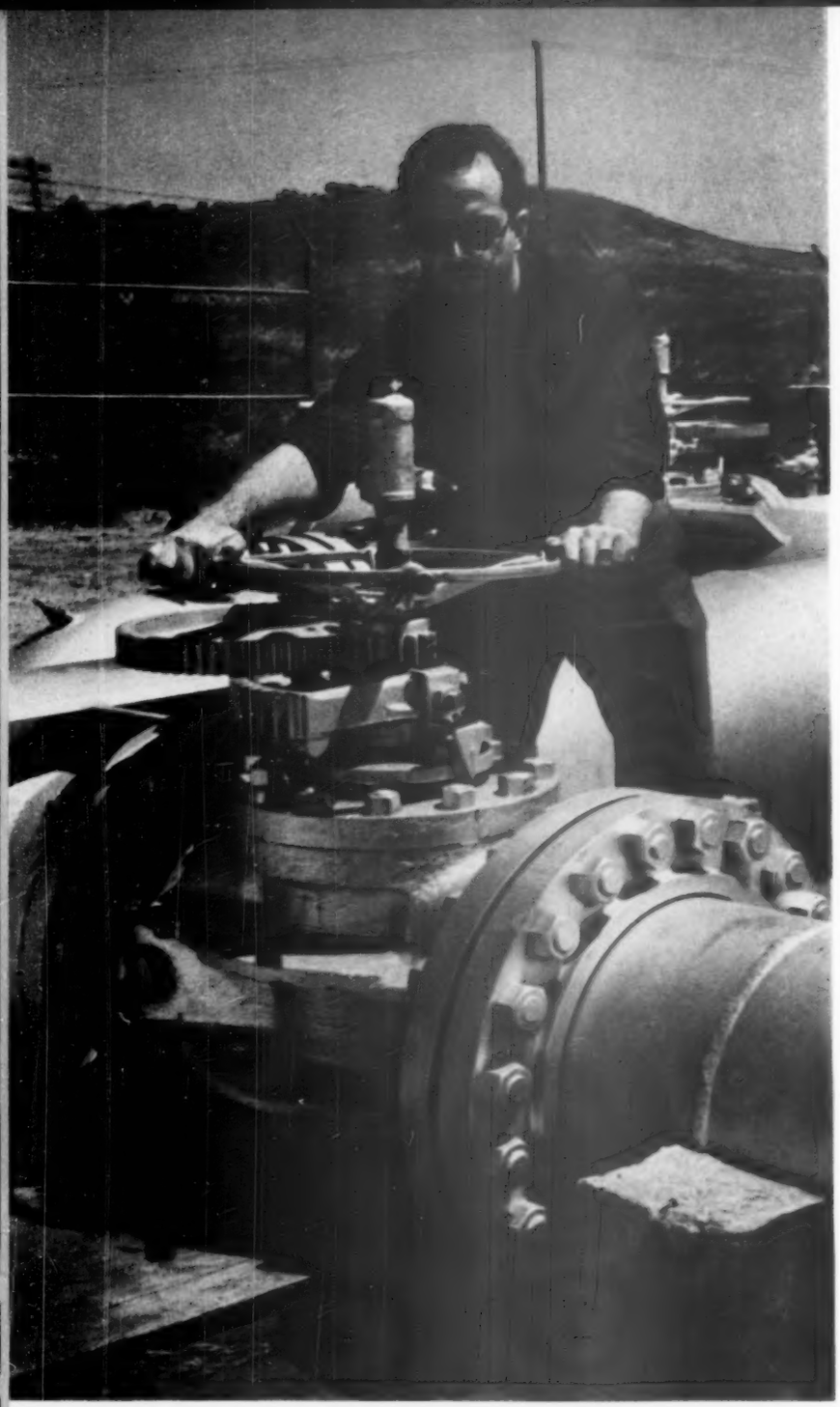

Photo by Clarence Lincoln Block

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The third classification, involving the use of arc welding in the erection of miscellaneous structures, such as framework, sheds, pipe systems, etc., is equally as important as the usages just discussed.

Fig. 6 shows arc welding applied in fabricating a steam manifold built from 4-inch pipe and 3-inch outlet All parts are of extra heavy mild steel. Joints are bevelled butt. Three passes were used with 3/16-inch electrodes.

Fig. 7 shows arc welding used to repair a stainless steel feed line. Pit holes in the fitting, caused by corrosion, are built up as described in connection with Fig. 4. The replacement cost of this fitting would be about $18.00! Repairing by welding was done in 10 minutes, at a cost of about $1.00.

In many cases, natural gas lines must be repaired with full pressure on! Welding gas lines under pressure, in fact, is considered more safe than welding a gas line that is full of gas without pressure, because under this latter condition, explosive mixtures of gas and air might be encountered. In case a small leak is discovered, a quick bead can be run over the leak to plug it, then a permanent weld can be made. If the leak is a bad one, however, a patch should be clamped to the line and then welded around in place.

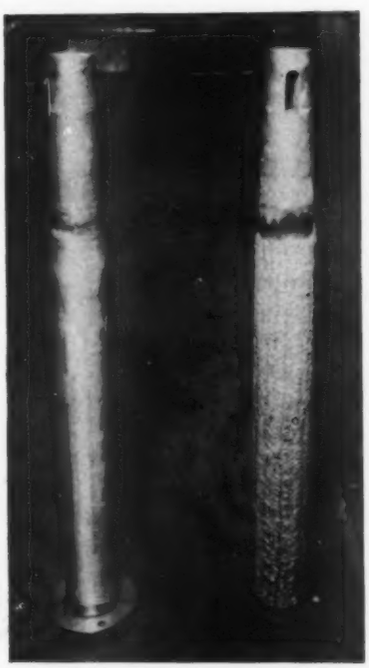

Fig. 3:—This shaft cost $60 when new, repaired by arc welding at but a fraction of this cost.

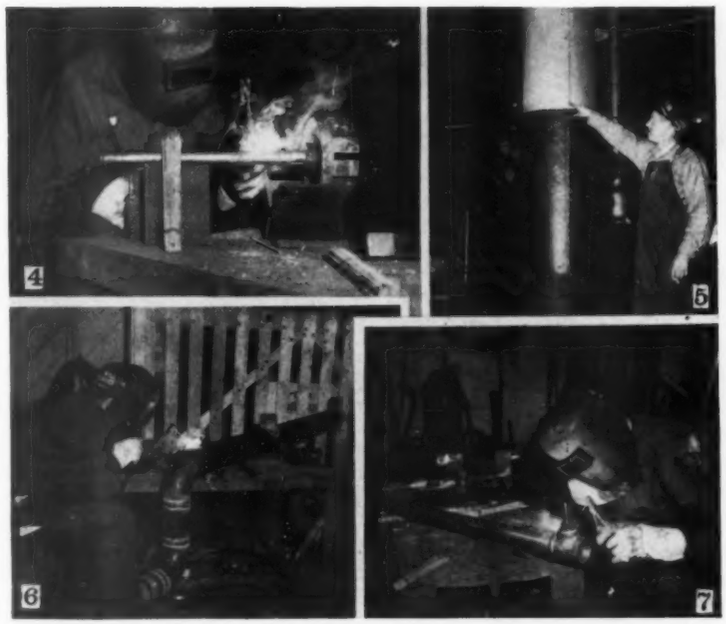

Fig. 4:—Arc welding applied to building up corrosion resistant impeller. Fig. 5:—Arc welding successfully strengthens iron columns. Fig. 6:—Arc welding applied in fabricating steam manifold. Fig. 7:—Replacement cost of this feed line fitting, $18. Repaired for $1 by arc welding!

Many gas companies find it necessary to recondition their couplings as well as their pipe. The steps in the procedure used by a large gas company in a complete overall reconditioning job, with all the work done along the right-of-way, are as follows:

(a) After ditch was dug, pipe was lifted out and supported on timbers over ditch.

(b) Coupling bolts were torch-cut and pipe was rolled away from ditch.

(c) Pipe cleaning crew with hammers and chisels removed earth and rust scale. Corroded spots were well cleaned to expose sound metal.

(d) An inspector chalk-marked all corroded areas which were to be built up with weld metal.

(e) Four 20-ft. pipe lengths were joined into one 80-ft. section. Joints were plain and butt type with back-up ring. The pipe was lined up and tacked as shown.

(f) Mounted on dollies, the pipe was roll-welded with two passes of 5/16-inch mild steel shielded arc electrode, averaging 3 joints per hour per man. Each section was stress-tested and drop-pressure tested.

(g) Corroded pits were filled in with 5/16-inch mild steel shielded arc electrode.

(h) Filled-in areas varied in size from small spots to large patches a foot square.

(i) Majority of line was relaid without protective coating. It is claimed that the reconditioned line is in better shape than the original when new.

To describe all of the thousand-and-one uses of arc welding available to the gas industry would require more space than this article could allow.

Suffice to say that arc welding is being more widely used than ever before. For in these days of all-out war production when replacements take longer to get, and in a lot of cases are virtually impossible to obtain, arc welding is frequently the short-cut maintenance repair work.

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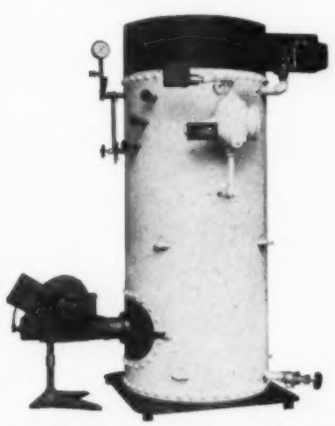

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Cedar Rapids, Iowa

Business Planning For V Day

By
Malcolm P. McNair

Chairman, Program Committee, Massachusetts Committee on Post-War Readjustment

Professor of Marketing, Harvard Graduate School of Business Administration

UNDER the existing conditions the topic to which I wish to direct your attention today may strike you as a waste of time or worse. Unquestionably the main objective of government, of business, and of every one of us must be to gain victory in this war of the continents. What are the reasons why we should consider the post-war problem?

Essentially it is all one problem. We are fighting to preserve the American way of life, but the drastic nature of the steps which we must take to win this fight will alter the American way of life so much that it will not automatically reappear without thought and effort. We are now spending for war purposes roughly two and one-half billion dollars a month. We have already appropriated toward war expenditures roughly four times as much as the cost of the first World War, exclusive of pensions. We are contemplating seriously the expenditure of as much as 45% to 50% of the national income for war purposes. This means a lean and pinched economy in every sense of the words. Since our war effort is now increasingly taking the form of plant conversion, that means that another conversion, back to peacetime uses, will be necessary after the emergency. Do not forget, furthermore, that at the end of the war the government will own many plants, that the government will have the funds, and that the government does not have to worry about such mundane considerations as profit and loss. Total war demands such drastic changes in the economy of the nation that the war period and the post-war period are both parts of the same problem from an economic standpoint.

For quite a few years past a good many people undertook to do a lot of thinking and planning about M day; but we can now see that they did not do enough thinking and planning, that they did not do it far enough ahead, and that they did not do it sufficiently seriously. Therefore I say to you that even in the midst of our war effort some of us had better do some thinking and planning about V Day. That is the day when the struggle finally comes to a halt and we try to put together again the broken fragments of our peacetime world. For if with these tremendous dislocations we come up to V Day without doing anything about the problems we shall face then, we may easily find that we have won the war only to stand in grave danger of losing the peace. That is what we did after 1918, because we did not have any plans for a post-war world. Let us not make that mistake this time.

There is another very cogent reason why private business should devote some of its best thinking to the post-war readjustment problem, and that is that a great deal of post-war planning is now being done by government agencies. Planning for V Day is being carried on by the National Resources Planning Board, the Federal Works Agency, the Department of Agriculture, the Federal Housing Administration, and numerous others. Practically all this planning is planning from the top down. Under these circumstances private business cannot afford to remain passive in its attitude toward post-war planning. It must be prepared to meet the government planning at least half way; and particularly it is the job of private business to make plans for stimulating private enterprise to seize the initiative in offering reemployment to men displaced from the war industries.

I want to urge on you the thought that in addition to planning from the top down, we need more planning from the bottom up, more planning that begins with the grass roots, that starts in the individual businesses, the industries, the trade associations, and the localities. This is a problem which democracy has got to solve, and the essential meaning of democracy is local people working together to solve their own problems. Failing a genuinely democratic solution of the problems which we shall face on V Day, it will be but a short step to the time when there will be no democracy. I say to you in all seriousness, therefore, that it is part of your job not only to make plans of your own but to help other private business enterprises in your localities to undertake this kind of grass-roots planning for V Day.

The chief elements of the problem include the following:

(1) **Consumer purchasing power.** In the long run consumer purchasing power can be effectively sustained only by production. And that means that there must be venturing by businessmen and investors on all kinds of peacetime projects. But in the short period immediately following the cessation of hostilities, consumer purchasing power will be adequate to bridge over the gap if industry makes a prompt and vigorous conversion to peacetime activities. On such prompt action on the part of private business depends the future supply of business purchasing power.

(2) **Business purchasing power.** Business purchasing power depends on the accumulation of reserves, development of a liquid position, adequate lines of credit, and access to the capital markets.

(3) **Business morale and attitude.** This, in my opinion, is one of the most important factors in the whole situation. If business has the courage and the confidence to carry on boldly, it is not too much to say that this will prove to be the key to the whole post-war problem.

(4) **Technological development.** We know that technological development is proceeding rapidly, as it always does in wartime.

(5) **Product development.** We cannot be certain, however, that product research is taking place on a sufficiently large scale, that the achievements of the laboratory are being translated rapidly enough into new products for the market.

(6) **Cost-price relationships.** Cost-price relationships are important because the behavior of businessmen is closely related to the outlook for profits, which, in turn, is to a considerable extent controlled by the existing relations between cost and prices. We cannot say what inflation will do to these relationships, or whether labor will perceive the mutuality of its interests with manage-

ment along these lines. But we can say that business needs to be particularly careful not to let cost-price relationships be warped by monopolistic attitudes and procedures.

(7) **Taxes.** Changes in the tax structure to impose less burden on venture capital or, indeed, to stimulate risk taking and penalize safety seeking are highly desirable.

What will be the most probable post-war situation in the event of victory at some time in 1943 or later? We shall probably then be devoting to war purposes approximately half of a national income of 110 to 120 billion dollars (depending on how prices move), and that is very broadly a measure of the employment shift that will be needed. The war effort, however, is likely to be tapered off rather than to be terminated abruptly, because of the probable need for continuing armament expenditures. Although a decline in the Federal Reserve Index of Production is of course to be expected as government spending for war purposes declines, this need not mean more than a temporary decline in the volume of socially needed employment. Many women will be returning from factories to homes, and numerous men will move from factory employment back to work in the distributive trades or service occupations, both of which by that time will have been substantially curtailed in man power. Temporarily, no doubt, employment will drop below the socially required volume; but if both government and private business do effective planning for this situation, the drop need be no more than temporary.

It is to be emphasized that in this immediate post-war period there will be an enormous backlog of *potential* demand for consumer goods. Rationing not only will have deprived us of numerous luxuries and conveniences, but will even have forced us to skimp on necessities. We shall especially want to buy automobiles, refrigerators, radios, and so on. At the same time, there will be a great *potential* demand for new capital goods. This is an enormously destructive war, much more so than the first World War. Even where actual destruction does not take place, depreciation and obsolescence are large. There will be a need, furthermore, not only to rehabilitate Europe but to industrialize Latin America and China. Right here at home the *potential* demand for new housing facilities will be great, because of the cessation of building during the war, because of technological developments, and because of the new standards of housing to which people are being educated. Therefore the *potential* demand for capital goods, particularly for construction goods, is likely to be very substantial for a number of years after the end of the war.

You will note that I have carefully used the word "potential" in talking about this probable post-war demand situation. Naturally *potential* demand does not get translated into anything tangible unless it is accompanied by both *the means to buy* and *the willingness to buy*. In the immediate post-war situation, so far as most types of consumer goods are concerned, I do not think that either the lack of means to buy or lack of the will to buy will be a serious problem. First, to look at the question of means: there will be wide holdings of government bonds; compulsory savings of one form or another are likely to have come into the picture; consumer credit will be susceptible of large expansion (provided we curtail it sufficiently now); and Social Security payments and separation wages will also add to the stream of consumer purchasing power. For a short period after the end of the war —and I mean a period measured probably in months — lack of consumer purchasing power will not be a serious problem. In fact, it is altogether probable that the available consumer purchasing power will be much greater than the supply of obtainable goods. With respect to willingness to buy, the deprivations which we shall have experienced will have whetted our appetites for accustomed luxuries. And although the outlook for the future will have considerable influence on the larger and more postponable items of consumer purchase, still, this does not appear to constitute a serious problem for the initial six to nine months of the post-war period. There will be enough consumer purchasing power and enough willingness to buy to start the ball rolling. Then it is up to private business, by means of the processes of investment and production, to provide the consumer purchasing power which will keep the ball rolling.

The initial problem is likely to be that of preventing a disastrous price inflation growing out of the impact of consumer purchasing power on a totally inadequate supply of consumer goods. We must prevent a repetition of the 1919-1920 experience, because it was that inflationary episode which produced the depression of 1921. To this end it will be necessary to maintain the government price controls and the rationing procedures through the transition period. These will have to be relaxed by degrees, not suddenly.

Provided this initial impact of consumer purchasing power on a wholly inadequate supply of consumer goods can be held within bounds, the most serious task will be that of converting business rapidly to peacetime production. In order that such a shift may take place, business needs to have plans ready for conversion and for necessary rehabilitation and expansion; it needs to have plans ready also for the aggressive promotion of its products; and at a little later point it needs to have plans ready for new products. In addition to plans, business must have adequate reserves or adequate possibilities of credit expansion to meet this critical transition problem. In the case of business demand, like consumer demand, there must not only be potential demand but there must be *the means of buying* and *the willingness to buy*.

Business must have adequate *purchasing power* for this transition period. On this score I recognize the many obstacles that exist, such as the tax situation and the limited access to capital markets. Nevertheless it is possible for private businesses to accumulate some reserves even though they have to pay taxes on them; and it is possible to curtail advertising, selling, and promotional expenditures at this time in order to build up reserves for the transition period. Although the problem of business purchasing power is difficult, I do not think that it is insurmountable.

It is on the score of business *willingness to venture* that I am most concerned, because I think this is going to demand a new morale and attitude on the part of many businessmen. By all odds the most important thing that any of us can do with reference to this post-war problem is to contribute to the development of a new morale among businessmen — a new and more optimistic long-range point of view. That really is the most significant thing I have to say to you today. In the first place, you need to combat the expectation of a post-war business slump. For the reasons which I have just been trying to outline to you, the expectation that the tapering off of the war economy will be immediately succeeded by a business slump is not well founded. Whether the situation subsequently will develop into a deep business slump depends on what business itself does. There is no inevitability about such a slump. *In all seriousness I want to say to you that the chief reason for expecting a post-war*

business slump is precisely the existence of the expectation itself. There is no surer way to put business into a tailspin than for a majority of businessmen to say to themselves, "Times are going to be bad; I guess I had better pull in my horns and retrench." That attitude on the part of American business is something that developed largely during the timorous '30's. It is something alien to to the real spirit of American enterprise.

In the 1930's we made the business cycle worse in this country by thinking too much about it. Businessmen paid too much attention to economists, statisticians, forecasters, and dopesters. There are some ways in which the effort to use too much business foresight defeats itself. The businessmen of America have got to learn over again that great truth which they used to know instinctively (and, parenthetically, there are many in the government who need to learn the same thing), namely, that the source of consumer purchasing power to carry off the products of business resides in the productive activities of business itself. It is the productive activity of business which creates markets; it is only through such productive activity that the size of the national income is increased. It is a mistake from any standpoint—business, government, or labor — to assume that the national income is a pie of fixed size and to devote energy primarily to quarreling about the size of the slices into which the pie is cut. It is also a mistake for business to refrain from production merely because some statistician scanning the economic horizon over a slide rule is unable to find the purchasing power which will absorb the company's product. It is the production itself which will create the purchasing power. That is the point of view which somehow must be resold to business, because it is private business which must plan to take the initiative in the reemployment of men from the armed forces and the war industries after V Day.

If private enterprise remains timid, apathetic, or even passive in its attitude toward the problems to which we must turn our whole attention on V Day, then government is going to step into the breach; because it is certain that the general state of public opinion will not permit a drastic deflation of the national income after V Day to anything like the level of 1932 or even the level of 1934 or 1935. And if the chief burden is thrown on government to try to maintain national income at a high figure, there can be only one result, namely, the disappearance of the private enterprise system and the establishment of a so-called managerial society, which is a polite name for a totalitarian state.

Don't look on government planning as an enemy. It will have undesirable effects only if business itself fails to plan and fails to take a more realistic long-range view. Business planning for V Day must be grass-roots planning from the bottom up; it must be planning by private enterprise; planning by industries; planning by localities; planning for new products and new uses; planning in terms of large turn-over, small profit per unit, and lowered prices; planning not for smaller production but for larger production, because it is this larger production which is the only sound source of the buying power to carry off the products of industry and increase the standard of living.

Presented at the Sixteenth Annual Business Conference, New England Gas Association, Boston, Massachusetts, March 20, 1942.

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A Gas Heating Research House Erected At Los Angeles, Calif.

By
Fred A. Herr

RANKING as the only heating research house in the western part of the United States and one of only two such structures in the entire country, a new Gas Heating Research House erected in 1941 by the Southern California Gas Co. and the Southern Counties Gas Co. for joint experimental work, passed through its first winter research season with flying colors and has been instrumental in contributing much valuable data heretofore only meagerly available on home heating problems in Southern California.

With natural gas being the most widely used fuel for house heating purposes in Southern California because of its easy adaptability to the numerous and various types of home construction in the Los Angeles area (where the bulk of Southern California gas consumers live), the two gas companies concluded early in 1941 that a modern heating research house would be a desirable addition to their other research facilities.

As early as January, 1941, the building of homes for defense workers took on the momentum that presaged a boom in that field of construction. Gas company officials felt that a heating test house would aid materially in keeping pace with this rapid development in residential construction as well as for gathering authentic information for use in promotional work.

The location of the house is on part of the land of the Southern California Gas Co.'s Aliso Street gas works in Los Angeles, a block distant from the Natural Gas Bureau's appliance testing laboratory which is also maintained jointly by the two companies.

The aim of the designers was to make the test house typical of the Southern California area for which the firms supply gas for heating purposes. The design incorporates various features of a one-family dwelling and combines into the single house the features of a typical modern home of the average six-room Southern California residence. It is a full-size one-story building. Sidewall construction is of typical Southern California stucco. The floor plan is L-shaped, with a short projection of one bedroom lending it the appearance of a foreshortened T. A large living room forms the short arm of the L, with the other arm containing a den, bathroom, dining room, a guest bedroom, kitchen and service porch. The six rooms and service porch have an area of 1,250 square feet.

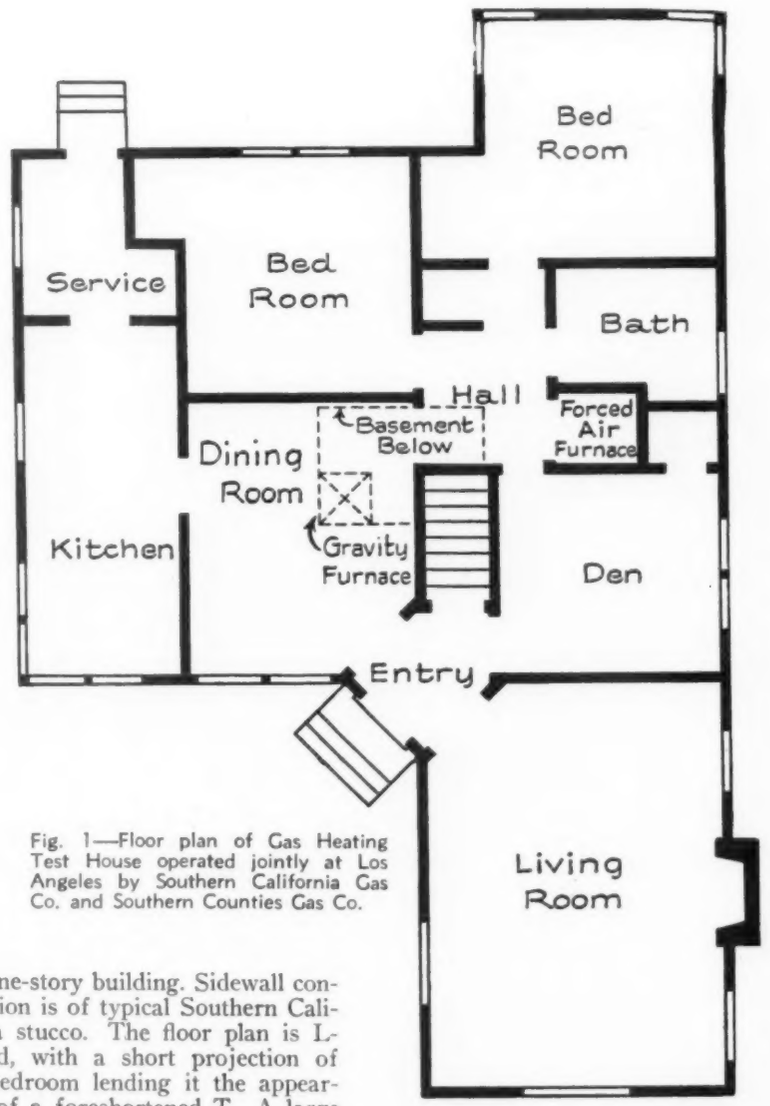

Fig. 1—Floor plan of Gas Heating Test House operated jointly at Los Angeles by Southern California Gas Co. and Southern Counties Gas Co.

The exterior of the house is completely finished. The inside has the appearance of a finished structure except that built-in fixtures and plumbing were regarded as unnecessary in view of the purely research purpose which the building was to serve.

To provide heat absorbing and retaining characteristics similar in all respects to those of an occupied dwelling, the rooms have carpets on the floors, Venetian blinds at the windows, supplemented by drapes in the living room, and there is sufficient furniture in place to reflect the appearance of a typical "lived in" home.

For testing purposes two strips of plywood wallboard are mounted on the walls of each room. One strip is attached just below the ceiling, the other at the level of the usual base board, just above the floor. The wallboard is mounted flush against the plaster of the wall. The plywood, it is claimed, makes it convenient to cut openings for cold or hot air

grilles, which can be mounted in different locations in the rooms to meet the varied demands of heating tests.

A small basement is located below the dining room, under the central portion of the building. A gravity type gas furnace used in tests is installed in the basement, with air ducts running to heat outlets in the rooms above. One gravity type furnace is used at a time. Provision has also been made for testing forced air furnaces by installing such units in any one of several closets in a hall on the first floor or on the back porch. The house is also equipped for testing floor furnaces, which can be mounted in the floor at any desired location.

There is also a fireplace in the living room with a chimney of normal size and shape which can be regulated to assure normal draft and ventilation, or can be shut off entirely. The fireplace is for draft and ventilation purposes only, for, being constructed of wood frame and stucco it cannot be used for open-grate heating, or gas-log tests.

A thermometer cabinet enclosing an official thermometer rises from the roof of the living room. The housing containing the thermometer is approximately two feet square. It has louvred sides. The cabinet rests on a timber platform which elevates it some three feet above the roof of the building. Atmospheric temperature recording devices are installed in the housing. Above it is mounted a weather vane and cup anemometer for measuring wind velocity. The anemometer's rate of rotation is transmitted by electrical means to a revolution counter installed on an inside wall and geared so that a change of one number per minute on the counter indicates a change of one mile per hour in wind velocity.

The interior of the house is equipped with a wide variety of instruments for recording temperature, humidity, air velocity, air resistance, air entrance, and various other factors of heat control and measurement. All instruments are designed to expedite the chief function for which the test house was built—the obtaining of information with which to answer the numerous questions concerning heating asked by customers.

Fig. 2—Exterior of new gas heating test house which is designed to represent a typical six-room Southern California home. Outside walls are of stucco.

The small tower rising from the roof (R) contains an atmospheric temperature recorder and is topped by a weather vane and cup anemometer for wind velocity measurement.

The test house provides information to answer the following questions, which are typical of the many inquiries put to gas company personnel by home owners and prospective builders of homes:

What size gas furnace shall I install in my house?

Shall we specify gravity or forced air type?

Shall we use a manually operated or thermostatically controlled system?

If we install a forced air system, shall we use return ducts or shall we have low or high registers?

Would several floor furnaces or unit heaters serve a home of our size better than a regular furnace?

With the test house designed to represent a typical six-room home, the results of tests made in it answer the greater number of questions asked by home owners.

Observations can be made in the test house for any type of heating equipment on the temperature of the various rooms and temperature distribution in any one room from one side to the other, or between floor and ceiling. Equipment also is available for determining the speed of heating from cold to comfort temperature, and the amount of gas required to keep the house at various temperature differentials between outside and inside. This can be obtained for various conditions of bright or cloudy days, wind velocities or rain. The amount of air infiltration in the form of outside air entering through windows and cracks around doors or windows can be measured for various wind velocities. These various tests have furnished much valuable data on the subject of air infiltration as a cause of heat loss.

Special equipment for making accurate and dependable measurements of air, resistance thermometers for taking temperatures at various locations in rotation, thermometer stands with series of thermometers attached at spaced intervals for obtaining vertical temperature distribution in the rooms, and numerous other devices for measuring and recording temperatures and air movement in every conceivable application to the heating of a home are found in the test house.

The new Los Angeles heating research house is the only one in the west designed to represent a typical home and used exclusively in heating research. The only other test house with comparable features is operated by the University of Illinois. The university unit, however, differs from the Los Angeles house in that it is of typical mid-western construction and designed for testing the heating requirements of the more rigorous winters in that section of the country.

The Los Angeles gas heating test house is operated under the general supervision of Guy Corfield, research engineer of the Southern California Gas Co. During the summer months it is planned also to use the building for testing domestic refrigerator systems.

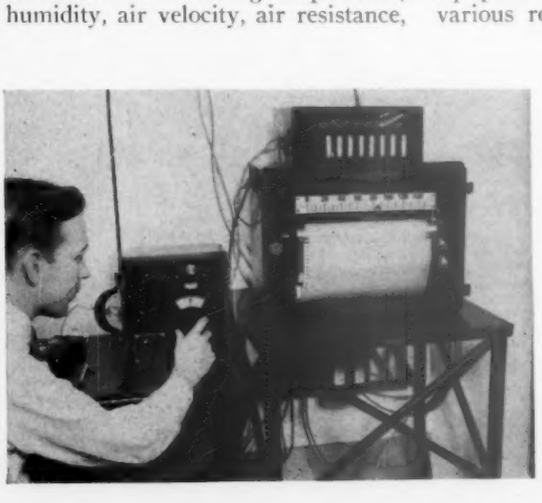

Fig. 3—Shown here is a recording resistance thermometer, which is used to take temperatures at different locations in rotation and record them on a chart indicating temperature, location and time.

Left, a potentiometer, another temperature measuring device.

Just look what "OLD DUSTY," THE GAS THIEF did to this meter!

When new this slide valve worked perfectly on a smooth and tight seat. Mr. Dustan Abrasion—"Old Dusty" attacked it, made channels and scores that not only cause gas leakage, but also increase friction, giving slow and inaccurate measure . . . losing money every day.

That's one way the dust entrained in gas steals your gas. It increases pressure below the regulating valves by destroying contact surfaces; it erodes and rounds the openings in orifice meters so they indicate less gas than actually flows through.

The remedy? Blaw-Knox Gas Conditioning Equipment! It's your best possible insurance against gas loss (money loss) due to dust eroded equipment . . . and it's your best preventer of pilot outages and similar service complaints.

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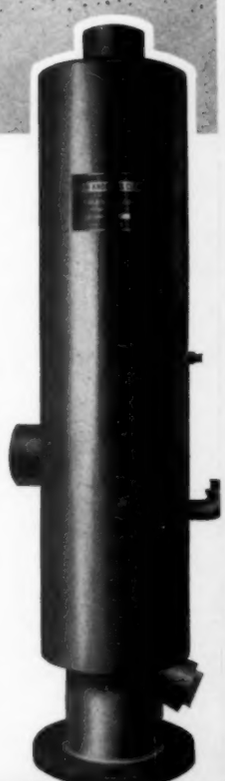
BLAW-KNOX "K" SERIES GAS CLEANERS as low as $95

Available from stock in two sizes and three weights. Compact, inexpensive, easy to install. Insure final gas conditioning near point of use, in front of good customer's meters, at district regulator stations, small city gate stations, etc.

ASK FOR COMPLETE INFORMATION REGARDING THE "K" SERIES GAS CLEANER BEST SUITED TO YOUR PURPOSE. Please state where it is to be placed, the maximum gas volume MCF hour, the minimum and maximum pressure.

This line has been cut to blow out accumulated dust. Imagine what happens when this dust goes through valves and meters.



BLAW-KNOX
GAS CLEANERS

Forty-Five Days Required to Lay Lirette-Mobile Pipeline Across Lake Pontchartrain

ONE of the most unusual pipelining jobs of recent years, a 25.59 mile submarine crossing of Lake Ponchartrain, was included in the 216-mile Lirette-Mobile natural gas line recently completed by United Gas Pipe Line Company of Shreveport, La.

The lake route, although it presented problems not commonly met in the laying of pipeline, was chosen because it represented a considerable saving and conservation in pipe, and the alternate route, being mostly through swamp, appeared almost as difficult.

Pipe deliveries held up the beginning of the lake crossing until August 28—the beginning of the hurricane season. Lake Ponchartrain is shallow and is well-known as a treacherous body of water. Three times in the course of the work, storms of hurricane force held up the construction when all equipment was ordered off the lake by the coast guard.

United had previously laid three lines across the Mississippi river, several miles below the lake on the portion of the line which leads up out of Lirette gas field. In laying this submarine crossing pipe was welded on an inclined ramp placed on a barge in the river. This was done by the use of a derrick barge facing the welding barge and a materials barge laying alongside the latter. Pipe had been welded to 100 foot stalks on shore. River weights, weighing approximately 1,200 pounds, were placed every 20 feet on the pipe to hold it in place against the strong current of the river which was between 90 and 120 feet deep at this point. This triple line crossing was laid in seven days time and it was hoped that approximately the same technique could be employed on the lake.

All hopes that the lake crossing could be laid by means of the inclined ramp set-up were dispelled shortly after the first day's attempt. The lake averaged 14-16 feet deep throughout and even the mildest breeze kicked up waves sufficient to make lining up of the pipe in the welding clamps almost impossible.

Next method tried was approximately the same as that which finally accomplished the job. Pipe was welded to lengths of about 2,400 feet on shore and then the 14-inch pipe was shoved out from shore and slung beneath pontoons as it entered the water. Many pontoons were used at first, but it was later found to be sufficient if two pontoons were placed on each end of this huge stalk of pipe. Tug boats dragged the huge tow out to barges in the lake.

A short distance east of Mandeville, pipe is welded in long sections, slung under pontoons and towed out into Lake Pontchartrain where it is then welded to the section already in the lake.

The equipment used to actually lay the line in the lake consisted of one welding barge, two derrick barges and four to six tug boats. The two derrick barges faced in toward the welding barge, forming a "U". As a tow came up beside the welding barge it was lifted aboard and placed in the clamps by one of the derricks while the other derrick held up the end of the pipe already laid.

Considerable difficulty usually attended the lining up process and the pipeliners used almost all of the numerous come-alongs known to the trade, one of the most helpful being the "Steamboat Jack," a screw and ratchet arrangement which can exert a tremendous pull.

The somastic coating which was placed on the pipe weighed about 25 pounds per foot, making the negative buoyancy of the pipe approximately 20 pounds per foot, the total deadweight out of water amounting to 97 pounds per foot. This weight coupled with the great length of the pipe made river clamps unnecessary.

The somastic provided protection against the brackish lake water, which would easily corrode uncoated pipe. After being coated with somastic the pipe was whitewashed, this white coating serving a dual purpose. Expansion from the heat of the sun while on the welding racks was cut down considerably and damaged spots caused in the towing, shoving and lifting aboard operations were easily spotted and repaired.

When the pipe was finally lined-up the welder laid on a stringer, three beads, two cover welds and finish, using about 36 rods to make each weld. While the welder did this, other men patched up the damaged spots in the somastic and when the weld was completed, laid on a field patch of somastic over the weld.

Welded and patched, the pipe was lifted from the welding clamps by the derrick barges; the welding barge was towed from beneath the pipe, and the pipe was lowered to the bottom of the lake. All equipment was then moved down to the end of the length just welded to await the arrival of the next tow.

It was possible to make only three tows of pipe per day, approximately 7,000 feet being an average day. This figure was, of course, cut down in the event of bad weather and many nights men merely waited on the barges without being able to do any work as tremendous waves battered at the equipment.

Various ways to expedite the work were attempted but the foregoing is the only method which proved practical. From the first day the equipment went into action in the middle of the lake to the time that pipe had been laid from shore to shore, the lake crossing took 45 days to com-

Upper: The "Cats" shove pipe as far as possible into the lake to make it easier for the tugboat to get started with the heavy load.

Lower: Welding was tough when waves like these covered the barge on which the men are standing.

plete, an experience none of the men who worked on it will ever forget.

After completion the line was tested under pressure and found perfect and has been operating up to rated capacity of 80,000 mcf per day ever since. The pipe is 14-inch OD built to stand pressures in excess of 600 pounds per square inch and has one-half inch sidewall.

Five leads were attached to the line after it was laid, for the purpose of enabling the cathodic protection department in keeping a check on line potentials to determine the probability of corrosion starting at any time. These leads are attached to small buoys which hold them up out of the water.

Another corrosion-prevention measure is to be found in the gate valves on each side of the lake. These are insulated so that none of the current found in the lake can flow into the land line and cause corrosion there.

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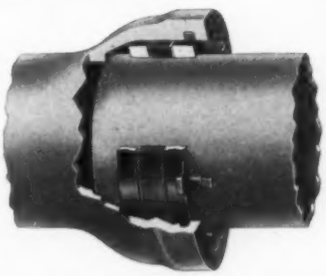

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Industrial Gas Keeps Pace

By
C. B. Phillips
Vice President
Surface Combustion Corporation

YOUR Program Committee has asked me to high-spot the important recent industrial gas developments. This, of course, I would be most happy to do, for development, I feel, is the heart of our industry and, of course, it is likewise the heart of my own company. However, in going over material for this particular discussion, I ran across some remarks made on October 9, 1940 at Atlantic City by our Mr. Henry Heyn which gave me a good deal of food for thought. The title of the talk he gave at that time, as many of you may remember, was "Industrial Gas Meets The Challenge of The Times." In re-reading this talk, I was impressed with the fact that Mr. Heyn made it quite clear to his audience that with all of the accomplishments he mentioned—in the wire industry—the malleableizing industry—the heat treating industry—the glass industry, and in the steel industry, it was still necessary for all of us to start immediately on new programs of further development in furnaces and controls and on the development of new gaseous processes. He predicted that better materials, more materials would be needed faster and at less cost than ever before. How right he was, of course, we can now easily understand. He urged the utility, the manufacturer and the A.G.A. to make the provisions and to take the steps necessary to maintain the position gained at that time and to further that position by coordinated effort and by the proper application of our knowledge not only to the problems of the moment, but to those likely to arise in the immediate future.

In other words, Gentlemen, he was warning us against just such an exigency as that which faces us. As accurate as were his predictions, I do not believe that even he had any idea of the enormous expansion that was to take place and that is still taking place every day. I do not wish to bore you with a great number of figures but one or two of them, I think, will give you a better understanding of just what our problems in this industry have been and what they are now.

Increase In Load

Industrial gas deliveries in 1941 were 1,137,232,000 m.c.f. or 18% higher than they were in 1940. Compare this with an increase of only 2.8% in commercial output and a decline of 0.9% for househeating and domestic sales and you have some idea of the complications involved. For remember, that as the industrial load increases, so increase multitudinous problems of manufacture, and in a program such as embraces us today, there is no time for specific developments, no time for new research, no time for disagreement and delay. SC, for instance, furnished 35% of all gas industrial furnaces in 1940 and are still furnishing the same per cent in 1941. The tremendous increase in production is apparent. If we are to hold our place in the sun, if we are to defend the American way of life, we must apply, and apply quickly, that information and that knowledge which we have built up over a period of years to the almost insurmountable task which confronts us.

So in the major portion of my discussion, I should like to discuss with you the problems of applying the knowledge and the developments already made rather than talking to you about such developments, now going on, which will not or cannot in the majority of cases be finished to fit into our present war program. Besides, some of the developments now underway cannot be discussed openly in the interests of the public welfare. And we, in the gas industry, and in the engineering field, where so many vital manufacturing processes are dependent upon us, must be extremely cautious in this respect.

Equipment Development

It would be a simple matter to recount to you the development of the furnace which will anneal at one time 40-ton battleship gun turrets, 50′ in diameter, or to tell you about the burners in this furnace which use more than 1,000,000 cubic feet of gas to bring this furnace to a temperature of 1200° F. I am sure you would also be interested in discussing extraordinarily large soaking pits, some having pits as large as 27′ long and 15′ wide, where ingot capacity is almost trebled. I know you would like to hear the story of the furnace which is today capable of turning out 50 calibre machine gun shell clips at the rate of over 5,000,000 a day. Or of the furnaces used in the manufacture of tanks where 15 different steps are necessary in the heat treatment of armor plate and other vital parts so that these tanks will hold up under the work of adverse conditions and withstand penetration by artillery fire. Or how such results are now obtained in 100 hours compared with the 400 to 600 hours required to do the same job in the first World War.

Today's Expansion

More important, however, is to show how the principles of heat treatment developed in the past few years have been applied to the problems of today. And remember, applying these processes and furnaces for today's vast expansion program places manufacturer as well as utility under the greatest difficulties and handicaps. You are called upon to furnish vastly greater quantities of gas than ever before and we are faced with problems of production capacity, plant capacity and skilled workmanship. Our own company is a good example of this. We have increased our production almost 400% and have had to do so with almost the same supervisory factory personnel that we used in ordinary times. This, of course, is not due to our unwillingness to add the additional men but because such skilled technicians as we need are extremely difficult to get. Naturally, every step possible is being made all the time to improve this condition. It is being improved materially but all this takes time. But the war effort—the Japs and the Nazis wait for no man.

And so we can easily see how thankful we should be that we have kept up a rigid program in the years past. For instance, in the steel industry, radiant tube annealing covers made possible the continuous mills so necessary to today's rapid produc-

tion. In the metals working industry, furnaces for heat treatment and improved combustion for forging furnaces are now a boon toward the rapid production of shells and bombs.

In this instance, it might be well to mention one outstanding example. In the manufacture of a shell, that is, the shell casing, one of the very last steps is to nose or draw the nose of the shell down to a taper. This, of course, is to lessen wind resistance and also to give the projectiles a path of greater accuracy during flight. After the shell casing has been made, it naturally becomes nesessary to soften the nose so that it can be formed into this correct taper.

Problems Met

One of the big problems to be met was that of scaling. Naturally, a hard, tight scale would get into the dies or sometimes even work its way into the projectile during the forming process. Controlled atmospheres have completely overcome this difficulty and their application to the rotary shell nosing furnace developed during World War #1 has now become a great factor in the manufacture of shells. The rotary shell nosing furnace is particularly acceptable to shell manufacturers because it gives a definite time temperature cycle and thus standardizes production. By applying the principle of the variable flame burner, burning vertically down into this furnace, the shell noses are properly treated so they can be formed and so that the forming dies and the projectile itself will not be damaged or suffer in any way from the presence of improper scale. As a result, a 155 mm. shell which, during World War #1, cost somewhere in the neighborhood of $45.00 is now made for less than 50% of that cost in greater numbers, in less time and with improved quality.

Another good example is the annealing furnace for aluminum sheets. During peace time pursuits, manufacturers of kitchen utensils and all manner of household appliances, used tremendous amounts of aluminum sheet because of its ductility, its light weight and fine appearance. A great deal of time was spent in the development of furnaces with accurate enough temperature control to handle these aluminum sheets rapidly and to furnish the finest results in the finished sheet. Now, these principles are applied, not to the manufacture of pots and pans, but in turning out tremendous quantities of aluminum sheet for airplane manufacture. As a matter of fact, it might be very truly stated that we could furnish more gas and more furnace capacity for the handling of aluminum than there is available raw materials to process at the present time.

High Speed Tools

Another interesting development of the past few years also comes to the forefront today as a life-saver in the manufacture of armament and war products. With the advent of the automobile, came the necessity of high speed tools. Because of the rapidity of automobile production lines and the size of the cuts that had to be made in order to turn out the parts with the great speed needed in this industry, it was found that ordinary carbon tool steels became heated to such a temperature that they lost their cutting edges. As a result of this condition, high speed tool steels were developed and every one here is familiar with the standard 18-4-1 tungsten high speed tool steels containing 18% tungsten. Tungsten, of course, is not found upon this earth in great quantities and it so happens that the supply of this precious industrial metal is very limited within our shores. It had long been known by engineers that molybdenum was a satisfactory substitute for tungsten but it had the one great disadvantage in that it made the steel much more susceptible to decarburization during heat treatment. Over a period of years, a simple and positive means of heat treatment was developed and this method, one of several but probably the most acceptable, is the controlled atmosphere gas-fired furnace. It was necessary in the development of this furnace to obtain atmospheres of absolute minimum percentages of decarburizing gases or non-permissible decarburization would result. The atmosphere in the furnace produced is generated in a container which is an integral part of the furnace and uses charcoal and an oxidizing base gas, such as air. The decarburizing constituents in this furnace are held to infinitesimal traces in the atmosphere produced and as a result, molybdenum high speed tool steels may be processed with extreme accuracy. The result —high speed tools which are comparable and in many cases, superior to those made with the extremely "critical" tungsten.

Other Processes

We are all familiar with the present-day tube mills with their controlled atmospheres—bright annealing—and normalizing furnaces, but when these processes for tube mills were developed, little thought was given to the fact that someday these processes and these furnaces would be so vitally necessary to our present-day aircraft industry.

In the malleableizing industry, some years ago development of controlled atmosphere gas furnaces cut production time as much as 110 hours and also made possible a new malleable iron known as pearlitic iron. The uses of this metal for our present war production program are almost limitless. The big problem, here, however, was to be ready for the contingency when it arrived and this, of course, could only have been done because engineers over the past few years have labored so diligently at the tasks of the hour. Of utmost importance of all of the products which must be manufactured with great speed nowadays are shells. Little did we think when the walking beam furnaces were developed that they would be used for anything but their part for peace time machines in appliances of all kinds. When the crisis came, however, engineers at once saw the possibilities of the walking beam furnace for the manufacture of shells so that now shell casings in great numbers can be continuously heat treated, saving many thousands of hours of labor and producing better shells at a greatly reduced price.

The manufacture and heat treatment of bombs involves practically the same operation as projectiles except, of course, that bombs are a great deal larger. The casing of a 500 lb. finished bomb is approximately 14" by 48" long and weighs somewhere in the neighborhood of 225 lbs. Many of these bombs are heated to the hardening temperature, quenched and then drawn. Here again developments of yesterday are helping us in the great emergency of today for into this breach of production, stepped the continuous conveyor furnace with completely automatic mechanical as well as temperature control. For one of the largest manufacturers of bombs in the United States, a continuous gas furnace, which consists of a hardening furnace from which the bombs are automatically quenched and then conveyed to the draw furnace, is now in daily use. This particular plant has been ordered to more than

double its capacity and similar continuous conveyor furnaces are now being rushed to completion for their use.

Heat Treating

Now, while it is true that all machines have an important place in our present-day program, the importance of heat treating furnaces can hardly be over-emphasized. Almost every metallic item used in peace and in war requires heat treating and yet we have been speaking of only one type of metal. This leaves us the tremendous field of non-ferrous metals, where bright annealing, softening and other processing is necessary.

In the wire industry alone, thanks to recently developed flame annealing, wire can be made at a much more rapid rate than ever before. This means the safe-guarding of our lighting and communication systems, both for war and peace time use.

In the glass industry, notable strides forward have been made and these are more than justifying themselves in our emergency effort. As an example of this latter, the gas-fired and automatically controlled lehr ordinarily used for annealing glass and for bending glass now makes possible bullet-proof glass cowlings for airplanes, inscribed convex and concave instrument dials and aviator's glasses with correct visual lenses.

And so we could go on and on with list after list of the various developments, the furnaces used in the various processes and the applications of these processes to our present-day industry.

The Present Emergency

Yesterday this country was producing what we have come to look upon as typical American products, appliances of all kinds, automobiles, radios, washing machines, refrigerators; now we are confronted with the greatest emergency of our history. This great emergency has interrupted our normal working life it is true, but with the spirit of Americanism, we know we must put aside the production of our peace time products and almost all of our other peace time pursuits, and arrange our production lines, our distribution systems, our energy and our work to the manufacture of a wide variety of war implements.

But industrial gas application and development will go on. The laboratories are still burning the midnight oil as they did in the past. Some of the developments will come more rapidly now because of dire necessity, and these we hope will provide the short-cuts, the better materials, the more competently equipped fighting forces, to give us the balance of power and the ultimate victory. But of those developments which will be used, we hope that their contribution in the years to come will be greater in the importance of human development and human living than they are now toward waging war. And still, many of the developments now going on will never find their place in their commercial manufacture until long after this war is over. As we are now prepared by our methods and our knowledge for war, so will we then be prepared for peace. This country, this hemisphere, yes, the entire world will enter upon a new era, one which will be of tremendous expansion and when this happens, it will be because the heat treatment of our vital metals and the use of industrial gas for more precise manufacturing methods will be among the major contributing factors making it possible.

So let us cooperate as we have never cooperated before. Let us put aside petty, personal, immaterial differences. Let us band together for the common effort as did our pioneer forefathers. In this way and only in this way can we make ourselves strong. In this way and only in this way, can we develop our industry and our art to its highest peak of efficiency.

In the past few weeks, there have been some disturbing orders and reports which affects many of us individually. I speak particularly of some of the restrictions that have been placed in various parts of the country regarding the use of gas for home heating. What is our attitude about this to be? Are we now to consider that the chapter on gas for home heating is closed? I do not think so. And what, you may be asking, has this to do with industrial usage of gas? It is my contention that the situations are analogous. All of these emergencies that arise must be handled in the light of past experience just as our present industrial emergency is being handled by the developments that were brought about during peace time in the solution of regular peace time pursuits. If we cannot sell gas now for domestic heating because of the necessity of using that gas for our war effort, we must so advise the public and keep them conversant with the part gas is playing toward the protection of their liberty. It is the application of a fundamental to a given situation and it will not only protect us against the future when we return to normal markets and normal conditions but it will also build even stronger our position in industry. Remember industry is composed of individuals and it is the individuals who compose the country. By serving, educating, truthfully explaining and convincing this public, we protect ourselves and our legitimate interests so that we can be and will be of further service to them and to our country in the days to come.

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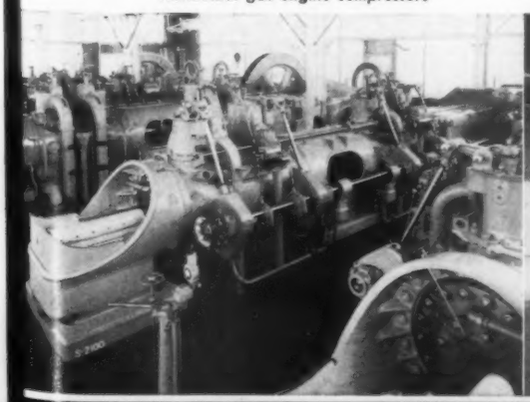
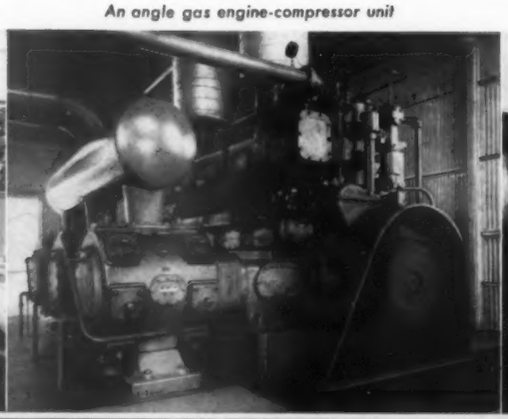
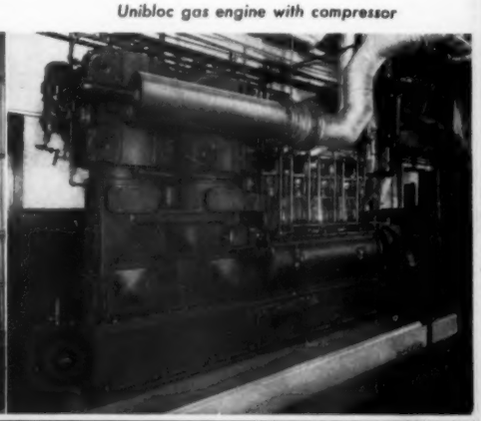
Horizontal gas engine-compressors



An angle gas engine-compressor unit



Unibloc gas engine with compressor



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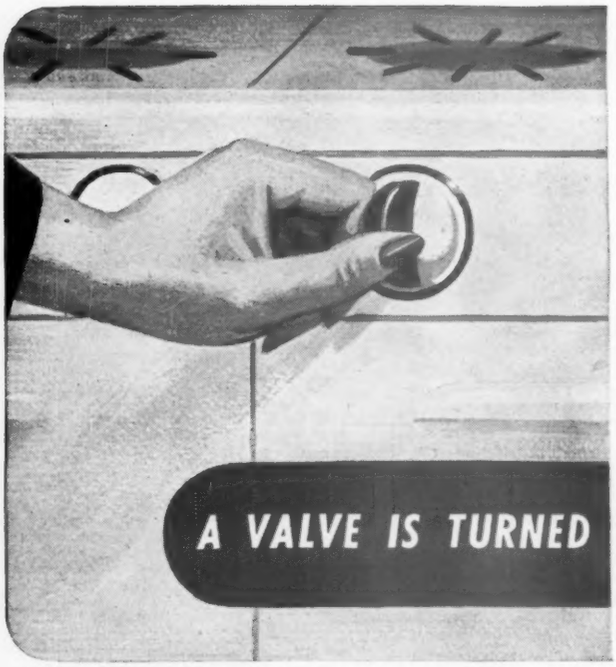

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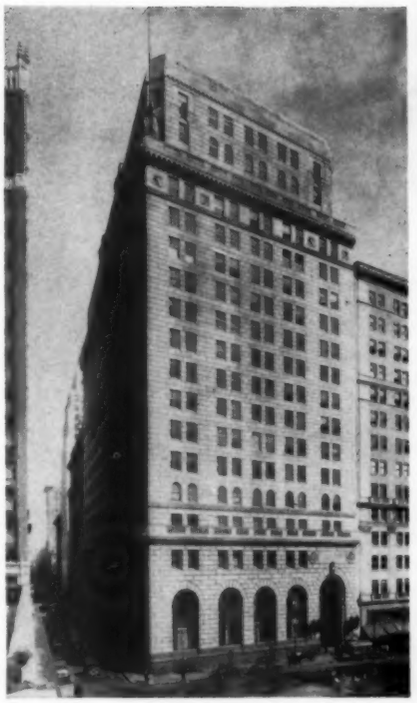
In the South— It's Gas Air Conditioning

By

James E. Kearns



The Air Conditioned Canal Bank Building.

GAS air conditioning is fast developing a southern accent. Perhaps nowhere in the country is large scale air conditioning assuming greater importance than along the Gulf Coast, where the climate is marked by excessive humidity and where the summer heat extends as much as two months longer than elsewhere in the country. Here, air conditioning is a key factor in the growing industrialization of the South; the development of new manufacturing and distributing centers in this enervating climate is given impetus by the establishment of better working conditions and by providing more comfort for the employees.

New Orleans—located where Ol' Man River loafs out to soak his feet in the sea — provides a perfect example of how greatly air conditioning has expanded during the past eight years. This important center of the South's shipping and import trade is one of the country's most completely air conditioned cities. Nine of ten of the city's business buildings are now air conditioned, as are 65 per cent of all retail shops of every description, the majority of theaters, ballrooms, and other entertainment buildings. In New Orleans, air conditioning has demonstrated itself definitely as a means of increasing business, and in many instances, as a means of preventing loss.

An outstanding example of the buildings which have increased renting and incidentally have built up the patronage of their tenants is the Canal Bank and Trust Building, a nineteen-story office structure, said to be the largest on the Gulf Coast. The management of this building has seen a rise in tenancy from a low of 65 per cent three years ago to 90 per cent or better, since installing a $498,000 year 'round conditioning system—one of the largest gas-fired installations in the South. Air conditioning, both summer and winter, has made the building ideally comfortable and the improved conditions are reflected in the consistently higher tenancy.

The problems faced by the engineers were as follows: A structural disadvantage was occasioned by the staggered H shape of the building. This resulted in a heavy sun load on the north side, which was most exposed to the sun's heat. Another structural disadvantage was a "heat spot" condition, which made certain offices too warm in the winter season. Climatically, the building was disadvantageously located because of the high humidity prevailing—humidity often reaching 93 per cent due to the large bodies of water surrounding the city.

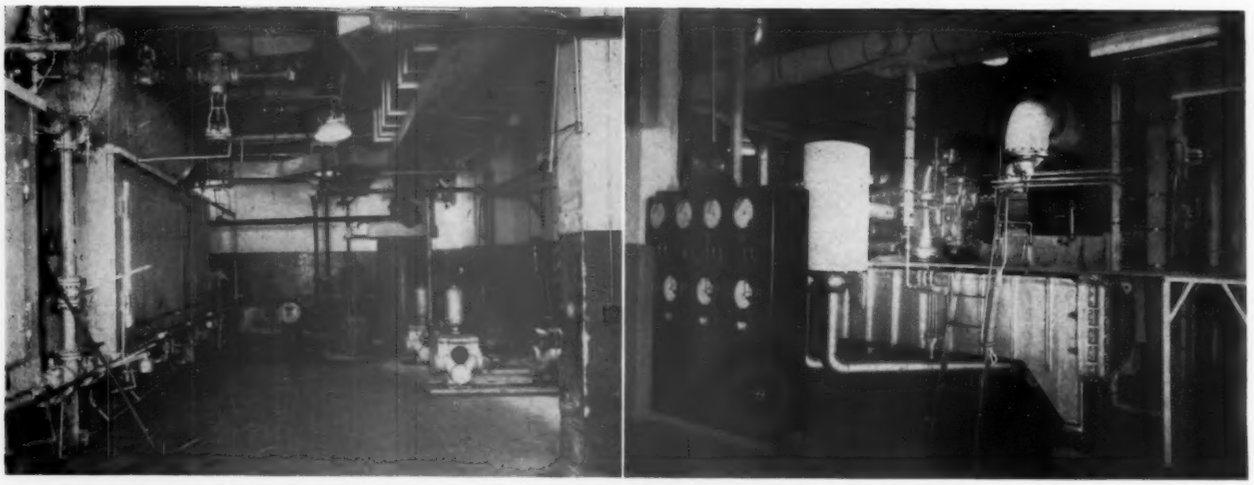
An over-all picture of the design brought the engineers to the conclusion that fan stations and zoning should be laid out to meet the demands placed upon the system by occupancy and the sun load due to the building's structural shape.

There are 38 fan stations located throughout the building. The north side of the building, which has the greatest sun load to overcome, has one cooling unit per floor (the building has eighteen floors; approximately 50 offices to a floor); on the east, west and south sides, one unit is installed for every three floors. This latter arrangement permits the cooling of the floors above and beneath the fan station through multiple ducts.

Gas-fired air conditioning equipment was decided upon for this installation because of the commercial gas rate which was made available. The equipment consists in part of two 400 hp. cross drum boilers. One thousand eighty tons of refrigeration are produced by these two boilers; the cost per ton hour averages five mills, or $1.00 for 200 ton hours. The steam generated is piped to two condensing turbines, one of 950 hp., operating at 4,290 rpm., and the second of 400 hp., operating at 4,154 rpm. Efficient operation has resulted in the consumption of but 13 to 13½ lbs. of water per hp. hour, with the burning of only 27.4 cu. ft. of gas per ton hour of refrigeration. The system uses 3,800 g.p.m. of condensing water at 88 degrees Fahr. This water is heated to 108 degrees Fahr., and then is carried to a forced draft cooling tower on the roof. Cooling is accomplished here with four 10 ft. fans. Condensing water risers run parallel with the elevator shafts and are so installed that their re-location is a simple matter, in the event that the remodelling of any one floor is desired. (Incidentally, the tower, finished in silver, is one of the most striking features of the Canal Bank Building.)

The turbines drive centrifugal compressors—one of them 780 tons, the other of 325 tons. Three thousand gallons of chilled water are produced per minute, from the refrigeration room; this is circulated to the fan rooms throughout the building.

These 38 fan rooms receive the chilled water through 12 in. risers; returns are also 12 in. pipes. Each fan station is a cooling unit, containing a 2½ inch finned coil, and a fan blower of 3, 5, or 7½ hp., depending upon the number of offices, or cubic feet of space to be cooled. One office on each floor has been sacrificed for the installation of fan equipment.



On the left, the two Heine gas fired boilers which power the Canal Bank system. On the right the steam turbine which drives the compressor.

The office used in each case is located near the center of the floor to permit an even spread of the cooled air throughout the building. Fresh air is admitted through intakes at each blower coil; intakes are supplied through a window in the office. The total amount of air circulated consists of 112,000 cfm. of fresh outside air and 255,000 cfm. of recirculated air.

Ducts, sized according to the air delivery required by each office in the building, carry the air from the thirty-eight blower stations. These ducts are of false beam construction and are located at the ceiling, semi-concealed. No manual control is used at grille outlets; the system is controlled by humidistats and thermostats.

The conditions prevailing in the building as a result of this air conditioning installation are 78 degrees Fahr. dry bulb and 66.5 wet bulb, when the outside temperature reaches a high of 95 degrees dry bulb and 79 degrees wet bulb.

Heat, during the short cold season is furnished by warmed air supplied through the same duct system. The cooling system is simply shut off in the winter time, and hot water is fed to the blower rooms; humidity is correctly established. Less than three months of heating service is required of the system during an average winter. Satisfied tenants and materially reduced operating costs have been apparent.

A factor of additional importance is the economical operation of the installation. A notable cost saver is the practice of circulating chilled water from the conditioning plant through a 20 ton compressor on the drinking water system. This greatly reduces the condensing pressure and power required. Lowered gas rates and the fact that the two high pressure gas boilers were already in service, saved on the cost of new equipment, and on fuel costs.

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President R. W. Miller On Staff of West Coast Air Corps

Robert W. Miller, president of Pacific Lighting Corporation, has been commissioned a captain in the Army and ordered to duty on the headquarters staff of Major General R. G. Cousins, commanding officer of the West Coast Air Corps Training Center.

Mr. Miller will be granted a leave of absence by the company under its policy of granting such leaves to all employees entering the armed forces. His duties will be assumed by his father, C. O. G. Miller, chairman of the board, LeRoy M. Edwards, vice president and general manager, Los Angeles, and R. A. Hornby, vice president, San Francisco.

How To Determine Boiler Efficiency

This Chart Will Do It For You

By

W. F. Schaphorst, M.E.

Newark, N. J.

EVERY boiler owner and operator should compel himself to answer these questions: "What is the efficiency of MY boiler? How much money can I save by improving conditions—grate, furnace, baffle walls, CO_2, soot, and so on?"

Inasmuch as the grate, furnace, and boiler are so closely allied—one dependent on the other—it is impossible to determine their efficiencies separately. The function of the grate is to hold the coal in such a way that the air can mingle with the coal to best advantage. That the grate plays a highly important role in combustion has been proved time and again. Plain grates have been removed, for example, and the more modern types substituted and worth while savings have invariably been effected.

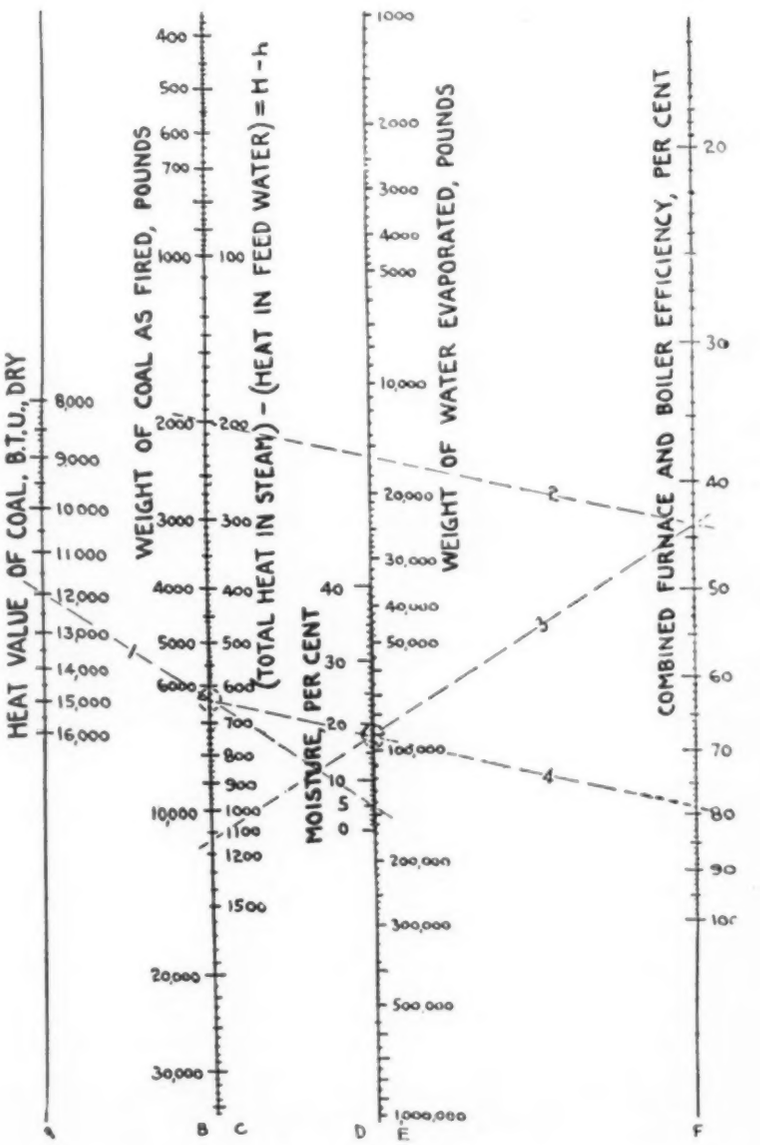
The same is true of the furnace. Modern methods prove that combustion is far from perfect in many a furnace of today. Various manufacturers have their own methods of perfecting combustion but in general the underlying principles are all the same. It is not this writer's object to discuss "method" here, but rather to stimulate interest in the obtaining of higher efficiency.

As for the boiler, unquestionably there are good boilers as well as poor boilers in use today. The consensus of engineering opinion is that a first class modern boiler is the most efficient of them all as well as the best.

Frequently, now-a-days, we read about "a new boiler efficiency record." Of course, this record means the combined boiler, furnace, and grate efficiency.

The writer has heard complaints about the difficulty of computing this efficiency. Unless one has a boiler text book handy, and unless one has had a college education, it is well nigh impossible to go through the gymnastics of the mathematical end of it.

To alleviate these sufferings the writer has therefore prepared the accompanying chart, and the directions below have been made as clear and simple as possible. Simply lay a straightedge across the chart four times, in the order shown on the dotted lines—1, 2, 3, 4—and the combined grate, furnace, and boiler efficiency is immediately found in column F.



For example, let us assume that you are now burning coal having a heat value of 12,000 Btu per pound when dry. As fired, however, the coal contains 5% moisture. By means of line #1 connect the 12,000 (Column A) with the 5 (column D) and locate the intersection with column BC as indicated by means of the small dotted circle.

Next, you find that 2,000 pounds of that coal, as fired, evaporates 16,000 pounds of water into steam, the steam pressure being 130 lb. per sq. in. absolute. The temperature of the feed water is 100 degrees F.

Table 1

Steam Pressure Pounds per Sq. In., Absolute.	*Total heat in the Steam H*
100	1186.3
110	1188.0
120	1189.6
130	1191.0
140	1192.2
150	1193.4
160	1194.5
170	1195.4
180	1196.4
190	1197.3
200	1198.1
210	1198.8
220	1199.6
230	1200.2
240	1200.9
250	1201.5
260	1202.1
270	1202.6
280	1203.1
290	1203.6
300	1204.1
350	1206.1
400	1208.
450	1209.
500	1210.
550	1210.
600	1210.

Table 2

Temperature of Feed Water, Deg. F.	*Heat in the Water h*
85	53.06
90	58.04
95	63.02
100	68.01
105	73.0
110	78.0
115	83.0
120	88.1
125	93.1
130	98.1
135	103.2
140	108.2
145	113.3
150	118.3
155	123.3
160	128.4
165	133.4
170	138.5
175	143.5
180	148.5
185	153.6
190	158.6
195	163.7
200	168.7
205	173.7
210	178.8
212	180.8

Connect the 200 (Column B) with the 16,000 (Column E) and locate the intersection with Column F. See line ♯2.

Now, in table 1, find the value of H opposite 130 pounds absolute pressure. You will find it to be 1191. Next, in table 2 find the value of h opposite 100 degrees feed water temperature. You will find it to be 68.01.

Subtract h from H and we have 1191—68.01=1122.99.

Now locate 1122.99 as closely as possible in column C and connect by means of line ♯3 with the intersection already located in column F. Thus we locate the intersection in column DE marked with a dotted circle.

Lastly, by means of line ♯4, connect the intersections thus located in columns BC and DE and the intersection with column F gives the answer as 79 per cent. In other words, the over all efficiency of the boiler, grate and furnace is 79 per cent.

Valuable Donations Made to Institute of Gas Technology

Two important donations have been received by the library of the Institute of Gas Technology, Chicago, Ill. They are collections of gas periodicals and proceedings of gas association meetings, donated by F. W. Stone, Ashtabula, O., and B. L. Sites, Chicago.

Mr. Stone, now retired, was a pioneer in the gas industry in Ohio. He is an alumnus of Illinois Institute of Technology, with which the Gas Institute is affiliated.

The Stone collection includes approximately 300 volumes, including some periodicals and reports dating from 55 years ago. It is especially valuable, Mr. Vagtborg said, since many of the older volumes included are difficult to obtain today. The entire collection includes much of the history of gas research during the last 55 years.

The materials will be used at the Institute in the study of gas technology and especially in making patent searches, which must precede all projects undertaken by the Institute, to prevent duplication of work.

The Stone collection includes publications by the American Gas Association, Chemical Technology, and the American Gas Light Association and affiliated groups, in addition to regular periodicals. The Sites donation includes volumes of Chemical Abstracts and the Journal of the American Chemical Society from 1911 to 1932.

Mr. Stone is a veteran of every phase of the gas industry. His first job, at the age of 16, was making pick up meter readings. He spent some years on gas construction work and finally became manager of four Ohio gas companies simultaneously.

The job from which he retired in 1941 was as vice-president, manager and director of the Lake Shore Gas Company. He was president of the Ohio Gas Light Association when it was the largest association of its kind in the nation. He was one of the first directors of the American Gas Institute.

Mr. Stone has always been an advocate of gas technological training. In making the donation to the Institute Library, he said, "What has been done is in the fact, but it is the future that counts. If I can help further, let me know."

These collections are valuable enough to remain an important part of the Institute Library even when the library has grown far beyond its present size, Mr. Vagtborg said. He added, "It is hoped by Institute officials that others with important gas technology works will follow Mr. Stone's and Mr. Sites' leads in making donations, now that a real gas technology library has been started."

Milwaukee Solvay Coke Company

The stockholders of The Milwaukee Coke & Gas Company have recently adopted a resolution amending the Articles of Incorporation so as to change the name of the corporation to "Milwaukee Solvay Coke Company."

The change of name has now become effective, and this notice is for the purpose of announcing the change. The amendment, however, does not affect the identity of the corporation, which will continue as heretofore with the same personnel.

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Natural Gas Cycling Industry Expands with Valuable By-Products

By
Frank H. Dotterweich
Professor of Natural Gas Engineering
Texas College of Arts and Industries

THE PAST THREE YEARS has seen the cycling of natural gas grow steadily into a very important branch of petroleum production and technology. The discovery of high gas-liquid ratio sands and the classification of these as gas sands (1), gave impetus to an industry which, from the very start, has been characterized by the highest phase of production efficiency. Briefly, the cycling of natural gas consists of bringing high pressure gas to the surface and extracting the hydrocarbons heavier than ethane and returning the dry gas to the same sand. This operation insures pressure maintainance and eliminates the possible condensation of the heavier hydrocarbon fractions, as unrecoverable liquids in the sand, due to the complexing phenomena (2), of "Retrograde Condensation."

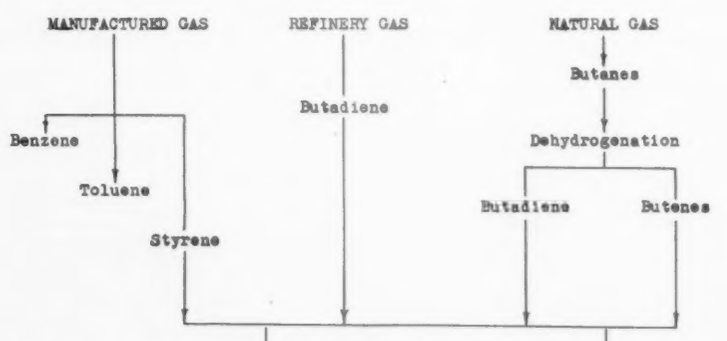
The first cycling plants developed handled, at that time, relatively large volumes of natural gas not exceeding 50 million cubic feet per day and depended upon cooling and stage separation to separate the so called liquid condensate valuable as a blending agent in refinery operations in the production of motor fuel. In certain plants kerosene fractions were also produced and recovered but in general the byproduct propanes and butanes, although extracted, were blown to the air.

Heat Interchangers, Separators and Storage

Modern cycling plants now process greater volumes of natural gas and some operate with an excess of 250 million cubic feet being processed per day. The method of stage separation has given way to the high pressure oil absorption process in which absorption pressures up to 2000 pounds per square inch have been employed with removal efficiencies of 99 per cent.

Accompanying changes in operation have also been changes in operating pressures and types of condensates produced. The pressures in the gas sands processed today vary from the minimum for the retrograde range to pressures in excess of 8,000 pounds per square inch. The type of condensate may vary from one containing a water white distillate from which about 90 per cent of high grade gasoline can be obtained, to colored condensates containing only 50 per cent motor fuel and appreciable amounts of the heavier hydrocarbon fractions. In one high pressure project an unusual condensate has been produced and it is reported that a certain portion of product closely resembles paraffin.

An example of cycling progress is the recent conversion of the Wardner Plant of The Chicago Corporation from that of a refrigeration-condensation type to a high pressure oil absorption plant (3). This plant operating in Stratton Field, Nueces County, Texas, formerly processed 60,000,000 cubic feet of gas per day from a sand at about a 5600 foot depth



PROPERTIES	BUNA S RUBBER	NATURAL RUBBER	BUTYL RUBBER
Strength	Good	Good	Excels
Elongation	Good	Good	Good
Chemical Stability	Good	Poor	Good
Wear Resistance	Excels	Good	Excels

Fig. 1: Hydrocarbon gases as a source of raw materials in the production of some synthetic rubbers and a comparison of these rubbers.

with injection pressures of 3000 pounds per square inch. Recent additions include processing of sands to a depth of 7400 feet with injection pressure of 4000 pounds per square inch. These additions and conversions made possible the increase in daily condensate production from 1200 to 2800 barrels. This condensate is further processed by plant operation to produce a 400 end point gasoline and kerosene fractions.

The development of the cycling industry in turn was accompanied by the development in plastics and some attention was given to the possibility of the production of synthetic rubber from natural gas. With large supplies of rubber available from the East Indies the cycling industry had little or no market for their byproduct propanes and butanes and the butanes recovered found limited use as bottle gas, for some synthetic rubber production (4), and the preparation of synthetic motor fuel and in the production of the relatively new 115 octane motor fuel, neo-hexane (5), for blending purposes.

The attack on Pearl Harbor which plunged this nation into active warfare immediately made byproduct and butanes of the cycling industry of extreme importance. As previously stated, large quantities of propanes and butanes are moved with the natural gasoline, and in the processing of the gasoline, these lighter hydrocarbons are, in general, separated and not recovered. This brought out that it is not economical to regasify these hydrocarbons and compress them in order that they may be cycled and stored with the dry natural gas. With an increasing demand for butanes, the cycling industry may install additional separation equipment to process the propanes and butanes as the market demands. The increasing demand for butanes may be expected in that the cycling industry will have as competitors for this new raw material, the manufacturers of aviation gasoline and the rapidly expanding synthetic rubber industry.

There are many types of synthetic rubber, but the two outstanding types will most likely be Buna S and Butyl rubber. The raw materials in the production of this rubber (see Figure 1) will come from the petroleum and gas industries and after complete development the properties of these rubbers should be superior to those of natural rubber.

The raw materials used in Buna S and Butyl rubber are butadiene, styrene and butenes. The styrene apparently will come as a byproduct of coal tar in the manufactured gas industry and it is reported (6) that 1,000 to 4,000 barrels per day, depending upon the amount of Buna rubber produced, will be required and may be available in the xylene fraction. However, either type of rubber requires butadiene and it is this raw material that the cycling industry may be called upon to produce in increasing amounts.

Butadiene is found in small amount in the low boiling decomposition or dehydrogenation products in refinery operations. Increased production of aviation fuel together with changes in refinery operation may produce additional amounts of butadiene for the rubber program, but should such operations fail to supply all of the butadiene required, the additional amount may be produced from butane.

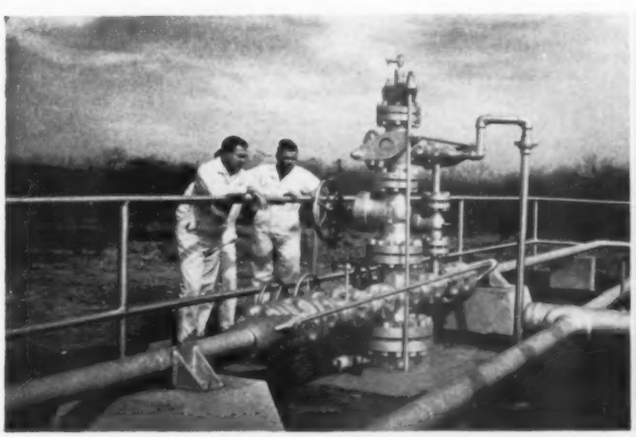
The production of butadiene from butane may be accomplished by dehydrogenation at 1,100-1,200° F. over chromium oxide catalyst supported on alumina. Butene is produced up to 60-75 per cent and by continued heating and recycling 60-80 per cent of butadiene is produced. Thus an overall production of butadiene from butane would be from 36-60 per cent. In the production of butyl rubber (butadiene and butenes) a suitable feed stock mixture possibly could be made eliminating the separation of butadiene and isobutene.

It is reported (7) that butyl rubber, the newest and least expensive of the synthetic rubbers, used in the manufacture of whole tires and tubes, may eventually solve the shortage in this country.

"An investment in synthetic rubber producing facilities of less than $15 per passenger car will provide sufficient rubber to keep America's automobiles on the roads," was the possibility recently announced (7) by an executive of the Standard Oil Company of New Jersey. This figure is based on the production of butyl-rubber requiring about $700 investment per ton of yearly capacity. In the production of buna rubber the investment runs about $1,000 per ton of yearly capacity. These figures as set forth indicate that in the very near future large quantities of hydrocarbon gases will be required in the new rubber industry and the cycling industry will find a new and stable market for its bottle gases heretofore wasted.

By-products of the cycling industry are not merely limited to the production of synthetic motor fuel and rubber but many other useful products from natural gas are possible and some of these have been set forth (8). Although many of these products are in the development stage the stored byproduct sweet natural gas may in the future find use in the production of hydrogen to be used in the synthesis of ammonia so essential in warfare and of growing importance in peace time due to the great possibility of the nitro-

(Concluded on page 60)



High Pressure Gas Input Well

High Pressure Gas Measurement

Some Blackout Tips from the Southern California Gas Company

By
Lucius S. Flint

SOME interesting and helpful pointers on blackout methods are provided by the experience of the Southern California Gas Co., Los Angeles. While not making any claim to perfection, this company has done the job effectively, has done it economically. Its methods are based on extensive study not only of utility operations but also of other industrial plants.

Utility blackouts, it was found, fall into two classifications—the office end and the plant end. In either case, efficiency must be measured by the following yardstick:

1. Whether the method selected is completely effective—whether it prevents the escape of any visible light.
2. Whether it's reasonably economical.
3. Whether the job is done with a minimum amount of new materials—this has been requested repeatedly by the government.
4. Whether it's convenient—speed of application and lack of interference with normal daytime operation are the important factors here.
5. Whether the appearance of the job conforms with necessary standards in that particular location.

With these considerations in mind, the Southern California company decided on black canvas curtains for its night offices. A heavy roll-up curtain is used—controlled by cords such as those used on Venetian blinds. While weight of the cloth was probably sufficient protection, it was sprayed black as an extra precaution.

The main problem here was to prevent escape of light at the top of the window and at the sides. A simple cornice at the top took care of that end. To hold the sides of the curtain firmly in place so there would be no leak here, the company installed simple pressure plates. These are nothing more than four-inch-wide wood strips hinged to other strips which are screwed to the wall. When the curtain is pulled, the pressure plate is turned over onto the edge of the curtain, holding it firmly in place.

When not in use, the curtain rolls up to permit normal light and ventilation. It's inconspicuous. Since the material was salvage material, the cost was low and the government request to avoid use of new materials where possible was respected. It's only a matter of seconds to lower the curtain into place when a blackout is called. The setup is really an ideal one.

The Blackout Curtain when lowered

Of course since canvas is a strategic material, it can only be used where stocks are available. However, other heavy materials can be substituted, either dyed black or sprayed. Only requirement is that the cloth be completely opaque and of a dark enough color not to reflect light.

Another utility company has gotten much the same results on its night offices with old window shades which had been replaced with Venetian blinds. To prevent light leaks at the edges and tops, this company tacked 6-inch wide strips of the old shade material to the window casings, about four inches lapping down over the glass. Other old shades were then mounted in the channels—clear up at the top. When the Venetian blinds are closed and the shades are drawn, none but very bright lights will cause leaks. The mask around the edges prevents escape of light here, while the Venetian blind cornice protects the top of the window.

Providing Protection From Broken Glass

Since relatively few office workers are on duty at night, the office blackout problem isn't really as serious as the glass breakage problem—in case of daytime raids—this company believes.. Reports indicate that a 500 pound bomb will break glass to distances of one-fourth mile. And English experience indicates that more people are killed or injured by flying glass than in any other way.

The problems of light and ventilation complicate the job of meeting this protective requirement, it was found. To tape the windows or to cover them with felt means that artificial light would have to be used entirely and also presents a dreary appearance.

This difficulty has been overcome in most cases through the installation of mat-backed canvas curtains. These roll up just like the blackout curtains. The canvas is backed with half-inch thick hair matting. The curtains are clipped to the side wall with graumets.

In the case of inside windows which are light sources — such as those in partitions in large offices—it is necessary to use one of these curtains on both sides. The glass broken by anything but a very near hit would be deflected by this covering—and no protection is entirely safe if a bomb falls close.

Since this treatment is somewhat costly, a substitute method is being sought for use in partitions which are not sources of outside light. The company is contemplating the replacement of glass in these locations with plywood panels. No final decision has been made on this point.

Of course the usual building precautions for handling incendiaries have been taken. And all employees have been carefully instructed as to how to act in an air raid.

Low Intensity Lighting For Plant Blackout

Because of huge glass areas and in

some cases a type of sheet metal construction which isn't entirely light-tight, the plant blackout proved much more difficult than the office blackout. Originally the company considered use of black paint on these windows. This idea was abandoned after experiments in other lines of business showed that a decided glass-breakage-hazard was involved.

Black paint, it was found, attracts heat from the sun, causing the glass to expand. Since most glass is tightly fitted, there is no room for that expansion and shattering or in some cases actual buckling is an inevitable result.

However, investigation among several of the airplane plants showed that in recent weeks at least a partial answer to this difficulty has been developed. The hazard is minimized by applying the black paint on the outside of the glass—this is necessary anyway to prevent reflections—and then painting the inside white. The white, it is reported, tends to equalize the effect of the black.

One plane manufacturer who has treated some 40,000 panes in this way, many of them in saw-tooth roofs where they get maximum exposure to the sun, has had almost no breakage. This plant however, recommends the following other precautions:

1. Don't paint large windows. In sizes up to 24"x50", results have been good but above that size trouble results.
2. Don't paint either single-weight glass or expensive plate.
3. Don't use paint where part of the glass falls in shadow and part of it is in bright sunlight.
4. Don't use paint in localities having very warm summer climates.

It is reported that a quarter of a million dollars worth of glass has been broken in Los Angeles alone—by improper use of black paint. So there is a definite hazard to consider. A large paint company which pioneered blackout paint in this territory now refuses to guarantee that it won't break glass regardless of precautions taken, generally recommends against its use.

In some plants where there aren't too many windows and where walls are completely light tight, inset panels or curtains made of black paper will probably prove satisfactory. The panels most commonly used are made on light wood frames—with the centers covered with roofing paper or heavy Kraft. A material such as roofing felt is advantageous because it is fibrous, would tend to deflect broken glass. The Kraft often used is of two types. One is a three layer paper having a center of asphalt. The other is a double weight paper printed black on one side.

Most practical installation method with these panels is a permanent one. Wherever the ceiling is high enough to permit it, they are hinged to the casing, are turned back or lifted up when not in use. This way, no delay or bother is involved in putting them into place. And normal daytime light and ventilation is permitted.

A simple roller curtain of paper has the same advantages—wherever it is practical. A sheet of heavy blackout paper having an overlap of six to nine inches on all sides is used. It is simply tacked to the wall above the window. A narrow strip at the bottom is folded over and stapled back—making a tube such as you'll find at the bottom of an ordinary window shade. A weight sufficiently heavy to hold the curtain down firmly against the wall is inserted here. When not in use, the curtain is rolled up above the window, ends of the weight being supported by rope slings which are fastened to the wall.

However, in view of its peculiar problems, the Southern California Gas Co. decided to tackle the plant blackout job through use of low intensity lighting. In most cases, small, 10-watt bulbs shielded by shades of the type used on gooseneck desk lamps have been installed in small fixtures set from 9 to 12 inches above the floor. Placed at regular intervals, these afford sufficient light for getting around safely and are not visible outside the building.

To enable the men to read gauges and inspect bearings, they are provided with flashlights which have the lenses covered with metal discs having 1/16" round openings in the centers. This amount of light is not visible except at very close range, yet is sufficient for the job.

In one place, the company is now experimenting with luminous paint as a solution to the blackout problem. The valve wheels in this plant are painted with this material and arrows of it have been laid out on the floor—pointing to equipment locations and exits.

A violet ray lamp mounted on the ceiling activates the luminous paint, making it show up almost as in daylight. Careful tests have indicated that the painted surfaces couldn't possibly be seen from the air. However, use of this material hasn't been definitely decided on because of the public relations angle.

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"WAR PROTECTION OF THE GAS INDUSTRY"

"War Protection of the Gas Industry," the most recent publication of the American Gas Association, is a basic study intended to provide a comprehensive source of information to gas companies on the protection of their properties and personnel and the repair of damage caused by air raids and other attacks. The material is printed in looseleaf form, 8½ x 11, conveniently indexed so that additional pages can easily be added when they are released. The information now available is included on 100 pages and contains specific suggestions for operating procedures, including details of English and European experience.

All this material was prepared by Mr. C. G. Segeler of the American Gas Association staff, and edited by a special committee of the Technical Section.

Copies are available at $2.50 to members of the Association and $5.00 to non-members. This price is in the nature of a subscription, and covers material which may subsequently be issued.

War Production Board
Division of Industry Operations

Oil Burners and Coal Stokers

THE War Production Board has ordered an end to the manufacture of oil burners and coal stokers for residential use after May 31, and limits the production of commercial and industrial types to orders bearing a preference rating of A-10 or better.

These actions, supplementing a recent cut in furnace production, were embodied in Limitation Orders L-74 (oil burners) and L-75 (coal stokers), both effective on April 15, 1942.

The orders are expected to save large amounts of ferrous material and considerable quantities of other critical materials which would have been required for the manufacture of the necessary automatic controls and fractional horsepower motors. According to officials of the Plumbing and Heating Branch, the stoker order will result in the saving of about 80,000 tons of iron and steel, and 142,000 sets of the controls and small horsepower motors.

Similarly, the oil burner order will enable producers of war goods to use 12,000 tons of iron and steel, and material for 211,000 sets of controls and motors which would otherwise have been wasted in non-essential articles.

The orders segregate burners and stokers according to capacity. The larger ones in each case are those commonly used for industrial purposes, while the smaller ones normally are residential types.

Order L-74 defines a "Class A oil burner" as any which has a capacity for burning oil at a rate in excess of 15 gallons per hour. A "Class B oil burner" is any with a lesser maximum capacity.

Order L-75 defines a "Class A coal stoker" as any which has a capacity for feeding coal at a rate in excess of 60 pounds per hour. A "Class B stoker" is any with a lesser maximum capacity.

The terms of both orders establish these limitations:

1. No person shall produce, fabricate, or assemble any Class A oil burner or coal stoker except to fill an order with an A-10 or higher rating.

2. For the period April 1 to May 31, fabrication or assembly of Class B oil burners or stokers must not exceed 1/12 of the production of these types during 1941.

3. After May 31, 1942, no person shall produce, fabricate, or assemble any Class B oil burner or coal stoker.

The manufacture of replacement parts for all types of burners and stokers is specifically permitted by the two orders.

Consumer Durable Goods Industries

Donald M. Nelson, chairman of the War Production Board, said April 7th, that WPB orders already issued or about to be signed provide for the virtual cessation of consumers' durable goods industries using critical metals in the United States and the conversion of their men, plants and facilities to an all-out war effort.

Some production is still being carried on, but within 3 months almost all of it will be stopped except for that production necessary for war and essential civilian purposes. The elimination of less-essential production and the conversion program have already changed the face of American industry and are now harnessing the entire economy to war.

Automobiles, washing machines, refrigerators, radios, lawn mowers, oil burners, and metal furniture are only a few of the many items which can no longer be produced with critical metals after cut-off dates provided in the various orders.

Illustrating his point, Mr. Nelson announced that two new orders with sweeping effect are in their final stages. One is a construction order which will confine all new construction to relatively small projects and defense work. The other is a new steel limitation order which prohibits the use of iron and steel in hundreds of items.

The steel order, to be issued shortly, will prohibit at an early date the use of iron and steel in hundreds of specifically listed metal products. But it is more than a steel order. It also prohibits the use of specifically listed materials as a substitute. This list of materials includes all of the metals and the scarce plastics.

The construction order will place severe limitations upon new construction of all types, confining it to relatively small projects and defense works.

Soon there will be no more processing of such articles as electric refrigerators, vacuum cleaners, laundry equipment, radio receivers, vending machines, amusement machines, and a host of electrical appliances.

Other industries producing metal signs, metal windows, metal furniture, metal kitchen and household utensils, metal toys, lawn mowers, domestic oil burners and coal stokers will be equally affected. Even such items as mortician's goods cannot be produced in the metal-working field.

Heating Equipment Frozen

In order to prevent the dissipation of existing plumbing and heating equipment stocks for non-defense building, modernization, or unnecessary replacements, the War Production Board on April 17th, froze all such stocks, except for retail sales of $5.00 or less, or for any sale on an A-10 or better preference rating.

The order (L-79) covers all new plumbing and heating equipment, including any equipment, fixture, fitting, pipe, or accessory of a type used in or connected to a water, sewer, or gas system; or any primary heating unit or accessory designed to provide building warmth.

The order does not cover used plumbing and heating equipment, or tools used for installation and repair, or hoses, sprinklers, and similar devices commonly attached to outdoor faucets.

In effect, the order prevents the sale or delivery by a dealer or any other person of furnaces, oil burners, coal stokers, and a wide range of other plumbing and heating equipment if the item is to be used for non-essential purposes.

The general restrictions of the freeze order prohibit the sale or delivery of new plumbing and heating equipment to any person, except that:

1. Retailers may sell or deliver items being sold for no more than $5.00.

2. Sale and delivery on orders bearing an A-10 or better preference rating is permitted.

3. Retailers may sell or deliver to other retailers, and to distributors, jobbers, wholesalers, or manufacturers of plumbing and heating equipment.

4. Distributors, jobbers and wholesalers may sell and deliver to any jobber, or to other wholesalers, distributors, or manufacturers.

5. Any new plumbing and heating equipment actually in transit on the date of issuance of the order may be delivered to its immediate destination.

6. Any person may sell to a purchaser who certifies that the item is necessary for the installation of specifically listed farm machinery and equipment.

Plumbing and Heating Branch officials said that certain classes of items will be released from the terms of the order if studies now being made show that some types of equipment cannot be directly used in the war effort.

While no accurate data is available on the inventories in the hands of dealers, manufacturers, or others in the industry, it is estimated that existing stocks of plumbing and heating equipment are sufficient to provide about 25 per cent of total war and defense housing requirements for the current year.

Disposal of the inventories will be accomplished through the placing of preference-rated orders with manufacturers, dealers, and others. The Branch hopes that retailers will sell a large percentage of their inventories of new equipment back to manufacturers and distributors. A rationing system for existing supplies is not contemplated at present.

All persons affected by the order are required to keep accurate records on inventories and sales for at least two years. Sellers are also required to keep the signed statements received in connection with sales to purchasers in the farm machinery and equipment field.

Tin Content in Solder

Conservation Order M-43-a of the War Production Board, as amended March 17, provides that prior to May 1 solder may have a tin content of 38 per cent by weight. After that the amount is reduced to 30 per cent.

Solder is, of course, essential in the repair of gas meters. Both before and since the issuance of the order, gas companies have been experimenting in the use of substitutes for tin content; for example, silver. The results have not so far been satisfactory.

The greater portion of the tin available before the war to the countries now constituting the United Nations, has been reduced by more than two-thirds. Contacts in Washington indicate little hope for a modification of this restriction.

In some States, applications have already been filed with regulatory commissions for modification or suspension during the war emergency of regulations that meters must be recalled at specified intervals for examination. In one state, Commission approval has been granted. WPB officials say informally that meters in service might well be left untouched until the war is over.

For the benefit of the industry, gas companies are requested to keep Headquarters informed of methods they are practicing or considering.

Limitation on Bottled Gas

Installations of new liquefied petroleum gas equipment were prohibited April 8th, by the Director of Industry Operations.

Liquefied petroleum gas includes butane, propane, propylene and similar products which are commonly used for cooking and heating in localities where gas from central plants is not aavilable.

The order forbids new installations of equipment to contain, distribute, or dispense liquefied petroleum gas, except facilities used in transportation and refining.

The limitation order, L-86, does not apply to material for maintenance and repair of existing equipment or to exchange of containers on the premises of any person in the normal course of distribution of liquefied petroleum gas.

Installations which were begun before January 14, 1942, may be completed, provided the work of installation is finished on or before May 15. Exceptions to the order may also be made in special cases by the Director of Industry Operations upon application in accordance with Form PD-397.

Use of preference ratings under the Petroleum order, P-98, and the Utilities order, P-46 for operations affected by Limitation Order 86, is specifically forbidden.

Plumbing and Heating Emergency Repairs

Preference Rating Order P-84. For the purpose of facilitating the acquisition of Material entering into the Emergency Repairs of Plumbing Equipment and Heating Equipment (as hereinafer defined), a preference rating is hereby assigned to deliveries of such Material upon the terms hereinafter set forth.

Statement of policy. It is the purpose of this Order to effectuate the policy of the War Production Board of making available materials required for plumbing and heating emergency repairs necessary to maintain minimum heating and sanitary conditions required for public health in the United States, its territories and possessions, without expansion or improvement of facilities, except where duly authorized or approved. The terms and conditions of this Order are to be interpreted in conformity with this expressed policy.

Definitions. (1) "Plumbing equipment" means any equipment, fixtures, fittings, pipes, accessories or supplies of types used in, or con-

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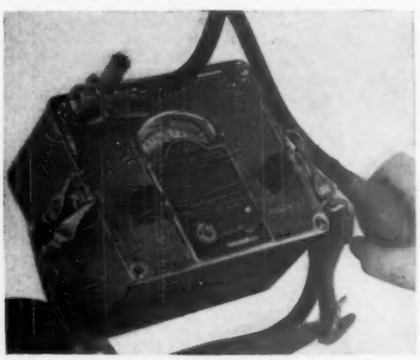

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nected to, water, sewer, or gas systems, regardless of whether or not connected with a central system: Provided, That "Plumbing Equipment" does not include any tools for use in installation or repairs, or any hoses, sprinklers or other devices of types commonly attached to outdoor faucets.

"Heating equipment" means any primary heating unit used to provide building warmth and any accessory or appurtenance used in connection with such a primary heating unit.

"Emergency repairs" means only those remedial repairs which are required by actual or imminent breakdown of Plumbing Equipment or Heating Equipment. It includes (but is not limited to) the emergency replacement of equipment which is worn out, damaged beyond repair or destroyed. It does not include the installation of superior type equipment to replace useable equipment, or a substitution more extensive than that which is necessary to replace the part or parts that are worn out, damaged or destroyed.

Assignment of preference rating. Preference Rating A-10 is hereby assigned, subject to the restrictions and conditions of paragraphs (e) and (f) hereof:

To deliveries, to an Installer, of Material required by him for Emergency Repairs.

To deliveries to any Supplier, who has received an order or contract to which the preference rating hereby assigned has been applied, of Material which will be delivered by him or another Supplier to the Installer pursuant to such rated order or contract, or will be physically incorporated into Material which will be so delivered; or which will be used, within the limitations of paragraph (e) (3) hereof to replace in such Supplier's inventory Material so delivered.

Restrictions on use of rating—(1) Restrictions on installer and supplier. No Installer or Supplier may apply the rating hereby assigned to obtain copper or copper base alloys which have been fabricated into sheets, wire, rods or tubes, or to obtain any scarce Material the use of which could be eliminated without serious loss of efficiency by substitution of less scarce Material or by change of design.

Restrictions on installer. The Installer may not apply the rating to obtain delivery of Material on earlier dates than required to enable him to make Emergency Repairs.

Restrictions on supplier. (i) No Supplier may apply the preference rating hereby assigned to obtain Material in greater quantities or on earlier dates than required to enable him to make on schedule a delivery rated hereunder or required to replace in his inventory Material so delivered. He shall not be deemed to require such Material if he can make his rated delivery and still retain a practicable working minimum inventory thereof; and if, in making such delivery, he reduces his inventory below such minimum, he may apply the rating only to the extent necessary to restore his inventory to such minimum.

(f) Application of preference rating. (1) An Installer or Supplier, in order to apply the preference rating to deliveries of Material to him, must endorse the following statement on the original and all copies of the purchase order or contract for such Material, manually signed by a person duly authorized for such purpose by such Installer or Supplier:

Gas Ranges

Gas cooking stoves are also subject to the terms of Limitation Order No. L-79, covering sales and deliveries of plumbing and heating equipment.

Gas cooking stoves, and other plumbing and heating items covered by the order, may not be sold except on orders bearing A-10 or better preference ratings, or to other retailers, jobbers, distributors or manufacturers in accordance with the provisions of the order.

Vacations

In response to numerous inquiries from industry and from labor, Chairman Donald M. Nelson of the War Production Board on April 16th set forth the official War Production Board policy in regard to vacations in wartime. It follows:

"Experience here and abroad is indicating that the worker, even when stimulated by the urgency of the Allied war situation, cannot work long hours and maintain peak output indefinitely. We know that he benefits in peacetime from an annual vacation. After the extensive overtime and the added emotional strain of the war effort, we can be sure some rest period this year is going to prove doubly effective in the restoration of his energy and determination.

"In planning the vacation program in 1942, it is particularly necessary in each plant that American Industry shows its ingenuity in securing the vacation benefits without paying a counterbalancing cost in productive hours lost. This can be accomplished by doing work ahead in the departments affected, by further overtime of the workers not on vacation, by a special program of training substitutes for those workers scheduled to go on vacation, by the spreading of the vacations over the whole year in those sections where this is possible and spreading them evenly over the full May-through-September period in those sections where the greatest vacation benefits are secured in summer.

"I am depending upon American Industry to embrace the vacation opportunity, and solve its accompanying problem, in a way that will not let our current output suffer and yet will fortify our working force for the still greater accomplishments the President's program demands. Under no circumstances can the desire or need for vacations be permitted to excuse any shut-down of any department of any war production plant."

Office of Price Administration

Prices for No. 1 and 2 Fuel Oils

Maximum prices for Number 1 and Number 2 fuel oils will not be increased on the Eastern Seaboard at this time to afford higher jobber margins, John E. Hamm, Acting Administrator, recently announced. The Office of Price Administration has had under consideration a request from numerous fuel oil jobbers that their margins be raised.

An increase of four-tenths of a cent per gallon in the maximum prices on these fuel oils was allowed in Amendment No. 4 to Revised Price Schedule No. 88 for petroleum and petroleum products, effective March 26. This was to compensate for higher transportation costs.

The acute tanker shortage, the rubber situation and other factors are causing a readjustment of economic conditions and operating methods in the petroleum industry. These questions will be the subject of continuous study by the Office of Price Administration with a view to making needed adjustments in price schedules as conditions require.

(Continued on page 59)

Order of Federal Power Controller Of Canada,

Requiring Permits Before Attaching New Gas Business

For the purpose of preventing, as far as may be possible, any shortage of gas to industries requiring gas to manufacture materials for war, the following Order has been issued, effective April 23, 1942:

1. On and after the date of this Order no new, old or replacement equipment for the use of gas for any purpose, including the purpose of cooking and heating, shall be sold or installed for use on the systems of the Union Gas Company of Canada, Limited; Dominion Natural Gas Company, Limited; and United Gas & Fuel Company of Hamilton, Limited, and its subsidiaries; Provincial Natural Gas Company Limited, and all other natural gas companies operating in Southwestern Ontario, without a special permit from the Acting Natural Gas Commissioner for Ontario, Queen's Park, Toronto, as agent for the Power Controller, and no gas shall be furnished by any of such companies for use in any installations hereafter installed without such a permit.

2. In case of transfer by a consumer of his own equipment from one house to another, permits to install such equipment must be obtained, and such permits will in ordinary cases be granted, provided such transfer does not involve the use of additional gas. Applications for such transfer permits shall be made to the Gas Company involved, who will forward the application to the proper authority with all pertinent facts.

Explanation of Order

If you are a present or prospective user of either manufactured or natural gas.

(a) If you desire to replace your present gas range, gas water heater or any other gas-using appliance and the new appliance will not require more gas than the appliance it will replace, and providing your replaced appliance is delivered to us at our shop to be destroyed and scrapped by us, you are required to make application to the Power Controller through our office for permission to do so.

(b) If you desire to obtain gas service in premises not now supplied with gas, you are required to make application therefor to the Power Controller through our office for permission to do so.

(c) In other circumstances than described above, where any change in your use of gas or of your appliances is involved, you are required to make application to the Power Controller through our office for permission to make such changes.

2. If you are a dealer in gas appliances.

(a) You may sell a gas appliance to any person for replacement of their present similar appliance, providing the replacing appliance is for the same use as and will not require more gas than the replaced appliance and providing that the replaced appliance is delivered to us to be destroyed and scrapped by us and providing that permission to sell such replacing appliance is granted by the Power Controller upon your application to him through our office.

(b) You may sell a gas appliance for use in premises not now served with gas providing that permission to sell such appliance is granted by the Power Controller upon your application to him through our office.

(c) You may sell a gas appliance for use in premises presently or previously served with gas providing that permission to sell such appliance is granted by the Power Controller upon your application to him through our office.

ITEMS FROM ENGLAND

Gas to Be Rationed

Gas is to be rationed in the near future. This was announced by Mr. Hugh Dalton, President of the Board of Trade, in the House of Commons on Tuesday this week. In view of the acute nature of the coal situation, domestic consumption of all fuels will have to be drastically reduced, a 25 per cent cut having been indicated.

No details are yet in being, but Sir William Beveridge, who was responsible for the food rationing scheme in the last war, has been asked to work out the details of the scheme. He will be assisted by Sir Stephen Tallents. Sir William has already stated that he has at present no idea of the solution of the problem, but his first step will be to approach women's organizations for their suggestions, because it is the housewife who is principally affected.

Mr. Dalton also stated, however, that he did not intend to wait for Sir William's report before taking immediate action to cut down fuel consumption.

The Gas Times—March 21, 1942

New Dublin Houses Have No Gas

People who take up residence in newly built Dublin Corporation houses will be without gas. The Dublin Gas Company has informed the city manager of its intention to discontinue the laying of gas pipes to Corporation houses and to fit no cookers in the houses.

At last week's meeting of the Corporation housing committee, at which the gas company's decision was announced, it was decided to appoint a deputation to wait on the Minister for Supplies in the hope that he would be able to import inch and inch and a half tubing and other fittings from England.

The company's decision, it was stated, was taken first to conserve gas supplies, and secondly, because of shortage of fittings. For almost a year now no new gas stoves have been released, and new cookers could be obtained only by exchange for secondhand ones.

The Gas Times—February 28, 1942

Gas Traction

Mr. H. D. Robinson, engineer and manager, Middleton Gas Department, states that a local mineral water manufacturer has decided to convert 80 of his vehicles to gas propelled. A start is being made with 30 and conversions are already well in hand.

Gas traction in Lancashire thus receives another useful fillip and from what I have been told in recent weeks there are first rate prospects of a considerable increase in conversions to gas driven vehicles in the New Year.

Four filling points have been installed for the Middleton gas vans, which have concertina type bags enclosed in steel frames. The bags hold 400 cubic feet of gas. The cost of converting one van is £30; thus the 80 conversions will cost £2,400. The conversions have been carried out so that the drivers may switch over to petrol should they require to do so but so far as possible they will be encouraged to use only gas.

The Gas Times—January 3, 1942

Naphtha and Xylole Order, 1942

The Secretary for Mines announces that in pursuance of Regulation 55 of the Defense (General) Regulations, 1939, the Board of Trade has made the Coal Tar Naphtha and Xylole Order, 1942. This Order has been published as a Statutory Rule and Order (S. R. & O. 1942, No. 218), and will come into operation on the 1st March, 1942.

The Order provides that no person shall dispose of coal tar naphtha and xylole in quantities exceeding the amounts quoted in the schedule except under license. The Secretary for Mines may also give directions regarding the disposal, treatment, use and blending, and, in certain circumstances, fix prices in respect of coal tar naphtha and xylole.

For the purposes of the Order "Coal Tar Naphtha" is defined as meaning "any liquid derived from coal of which, when tested by the standard method, not more than 5 per cent shall have distilled when the temperature has reached 125° C. (running point) and not less than 90 per cent shall have distilled when the temperature has reached 200° C. (stop point), and which consists of at least 80 per cent of hydrocarbons and which contains not more than the percentage of toluene permitted by the Control of Toluene Order for the time being in force."

"Xylole" is defined as meaning "any coal tar naphtha of which, when tested by the standard method, not more than 5 per cent shall have distilled when the temperature has reached 138° C. (running point), and not less than 95 per cent shall have distilled when the temperature has reached 145° C. (stop point)."

Applications for disposal licenses should be addressed to the Mines Department, Dean Stanley Street, London, S.W. 1.

The Gas Times—February 28, 1942

Stretching Rubber For Tire Mileage

By
Fred E. Kunkel

UNTIL synthetic rubber makes its appearance, and in the face of a threatened tire shortage, the question of tire conservation and getting the maximum mileage out of tires becomes of paramount importance in fleet operation.

Tire engineers know how to get the most out of tires but the average fleet owner has never worried about the tire situation except trying to hold down costs. Today cost is out, and tire mileage in. It is a question of proper use and care to obtain only one result . . . MILEAGE . . . the greatest mileage possible.

Leaving out of consideration off-the-highway service where traction is the first consideration, we find that having the *correct* type of tire for any given operation, other factors entering into longer wear include the nature of the loads and load distribution, speed, and no tire is ever right for the job if the size is not right . . . a factor which is determined largely by the weight of the loads.

Heavier loads naturally require larger size tires. Overloading causes a tire to develop excessive internal heat, which is one of the most common causes of premature failure. With better tires on the market fleet owners have carried heavier loads and with speedier trucks transportation has been faster than ever before.

Today the question is one of making less speed, or changing over to horse and buggy, and watching the loads. Heavy loads and high speeds generate terrific heat inside an ordinary tire. The average truck driver today is not conscious of the fact that he must reduce his speed, reduce his load and save on tire wear. He has never worried about that before . . . the first objective is to make him worry . . . and help carry the burden of the fleet owner or at least share his view that something must be done to save rubber.

Uniform air pressure must be maintained and tires checked more frequently than heretofore. Air gives inside support to tires. Over-inflation and under-inflation are equally bad. There must be just the right inflation . . . to minimize tire trouble and increase tire mileage, so that a tire will outlast all previous performances.

Hundreds of truck tires are taken out of service every day, worn or blown out before their time, the majority of which would have delivered far more mileage if a few precautions had been taken, or if an analysis of the operation had been made and corrective action taken.

Overloading is directly or indirectly the cause of a large percentage of premature truck tire failures. Normal flexing for which tires are designed will go on almost indefinitely, without causing appreciable damage to tire cords. But overloading causes overflexing, creates heat which weakens the cords and causes tires to fail before full tread mileage is obtained.

Overloading also results in rapid tread wear because it increases the load on each square inch of tread in contact with the road. Uneven wear also results because the tread is distorted and cannot move naturally against the road. Overloading causes blowouts.

Anyone unfamiliar with loads should study factors or call in a tire engineer, or a local tire representative (preferably a distributor) who will scientifically determine the proper loads.

While fleet superintendents have been familiar with the question of proper inflation no serious attempt was ever made to positively guarantee proper inflation. In most fleets tires are checked once a week. In very few fleets has the system of tire inflation checking been carried on daily before the truck left the garage.

Either too much or too little air decreases tire mileage. Overinflation reduces deflection and tread contact area. It increases tension and strain on the cords so that when an object is struck (like a hump in the highway or rough road, or holes in the road caused by weather erosion, the cord body is bruised on the inside and bruised much easier than when the proper air pressure is maintained.

Since drivers have been accustomed to take any kind of road at the same speeds it becomes increasingly necessary to slow down for all road hazards of this type for each bump in the road will cause fabric wear.

Over-inflation to obtain greater carrying capacity results in severe carcass strain. Too large a percentage of the tire strength is used to hold in the air pressure, leaving too little strength to transmit driving and braking forces, resist bruising and so on.

Increasing air pressure reduces the amount of tread contacting the road, causes the wear to take place over a smaller area in the center of the

tread, resulting in faster tread wear. It also puts a tension on tread rubber and rubber under tension wears faster, cuts easier, and has a greater tendency to crack.

Overinflation also reduces skid resistance . . . a well known factor, but it also causes harder riding and increased upkeep of equipment, more bouncing and spinning, causing faster tread wear and loss of traction.

Over-inflation may be the result of putting in too much air pressure when the tires are cool, before they start on a haul with a load, either purposely or because of an inaccurate air gauge, or by building up of air pressure in service.

A certain amount of air pressure built up in service is normal, and should never be reduced by "bleeding." To do so does not reduce tire temperature but causes a tire again to flex as it did when cool and cancels the value of compensating natural build-up which has already taken place. Bleeding results in more heat, which added to the temperature already present, is likely to cause premature tire failure through heat blow-out.

Under-inflation affects tire life in the same way as overload. It increases the flexing in the tire and results in excessive internal heat and early failure. Fast, uneven tread wear is the result of under-inflation caused by scuffing and wiping of the edges of the tread.

Heretofore it was the rule to inflate tires when cool at least once a week or two times a week, seldom three. But daily check and proper inflation is recommended today no matter what the labor cost. And of course the guage must be accurate. It should be checked periodically against a master guage at a tire dealer or distributor's place of business.

And defective or worn out valve cores should be replaced as rapidly as discovered, and every effort made to discover them by careful checking. Valve caps should be used at all times on all valves, because a valve core is a delicate mechanism and a leak may be caused by minute pieces of dirt, oil or grease. The valve cap will prevent leakage through the valve. This saves much in tire wear when exigency arises while driving and when a driver is not conscious of the need of checking tires.

Uneven tread wear is a factor having nothing to do with over-inflation or under-inflation, and where dual tires are used becomes of prime importance. Inside dual tires, particularly on free rolling wheels, or on axles with no camber, operating on crowned roads will be worn unevenly. Any fleet superintendent should know how to handle factors resulting in uneven tread wear without further explanation . . . but a factor which heretofore has not been given the careful consideration which now becomes necessary.

Tire temperature may result from atmospheric temperature, speed and load. Most fleet owners lack instruments for the accurate measurement of tire carcass temperature. They should now be bought. Otherwise operators must watch air pressure built up during a trip or on regular runs. Load or speed must accordingly be reduced or larger capacity tires installed, if premature failures are to be prevented.

Practical rules for longer truck tire life include:

1—Using recommended size and type rims. Rims that are too small reduce tire carrying capacity and rim flanges will not properly support tires, causing excessive flexing.

2—Never overload your tires. If loads exceed maximum recommended, the only answer is to change to tires of larger capacity. The maximum carrying capacity cannot be increased by over-inflation.

3—Check and inflate tires daily, if necessary, to the recommended pressure, before the truck leaves the garage. Three-fourths of all tire troubles are due to improper inflation.

4—Investigate sudden drops in air pressure. Check valve cores, check for inside cuts and slight punctures; remove tube and check with pressure under water.

5—When pressure has risen above normal in a hot tire do not bleed air to restore initial pressure.

6—See that dual tires are properly mated.

7—Tires on trucks operating empty or with light loads may be inflated to somewhat less than recommended if speeds are not excessive. But first be sure of the man who does the driving.

8—Never use a boot or blow-out patch in a good tire except for a short emergency. Many tires that could be successfully repaired if taken out of service in time are ruined by boots.

9—Always use a new tube in a new casing so long as practicable. It is the tube that holds the air which carries the load. The casing protects the tube.

10—Repair or replace broken or bent rims or lock rings.

11—Never let the tube valve touch the brake drum. It carries heat directly to the tube.

12—Be certain that proper size flap is used for the tire and rim size being used. Never use an old or cracked flap.

13—On light trucks with semi-drop center rims, do not try to mount or dismount the tires without removing the side or lock ring. It injures the tire beads.

14—Never fasten chains on wheels too tightly. With reasonably loose chains you get longer tire wear and greater traction as well.

15—Do not let gasoline or oil come in contact with tires and tubes.

16—Avoid jerky starts and sudden stops—they grind valuable rubber off tire treads.

17—Make sure your wheels are always in alignment to avoid uneven and rapid tire wear. This should be checked more frequently than ever was the established custom heretofore.

18—Drivers should be penalized for scraping tires against curbs and drastic action used to compel them to listen to instructions on this matter. They have through the habit of years paid no particular attention to this phase.

19—Caution drivers to slow down for curves and check on the last two points if necessary, by following drivers on the highway unknown to them. The present emergency situation calls for drastic measures never undertaken heretofore and of correcting bad driving habits incurred through years of bad practice. This not only applies to tires but to such items as brake wear, clutch trouble, rear end trouble and other items which will be more and more difficult to procure for replacement purposes until the present emergency straightens out and production gets back into a settled groove.

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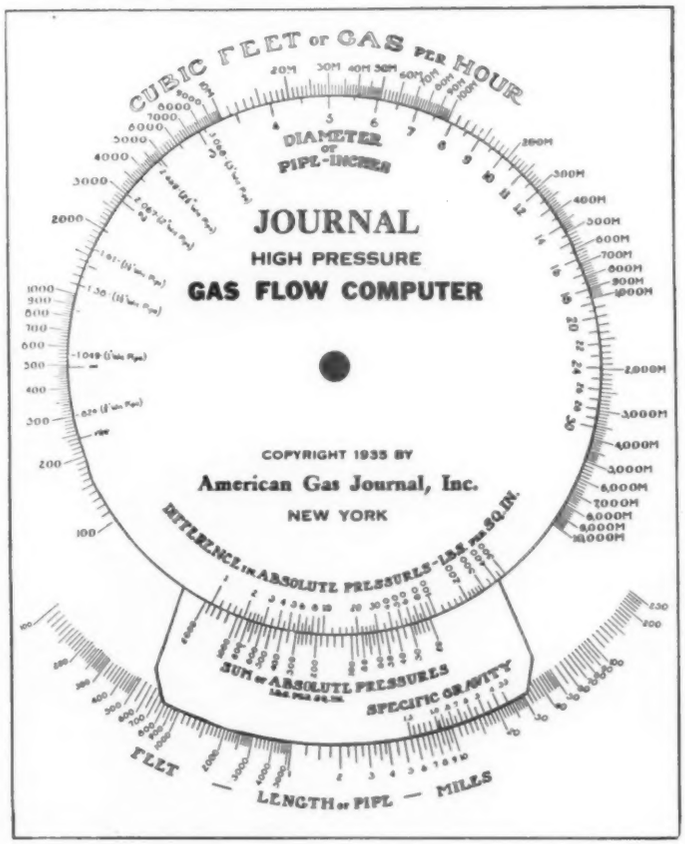

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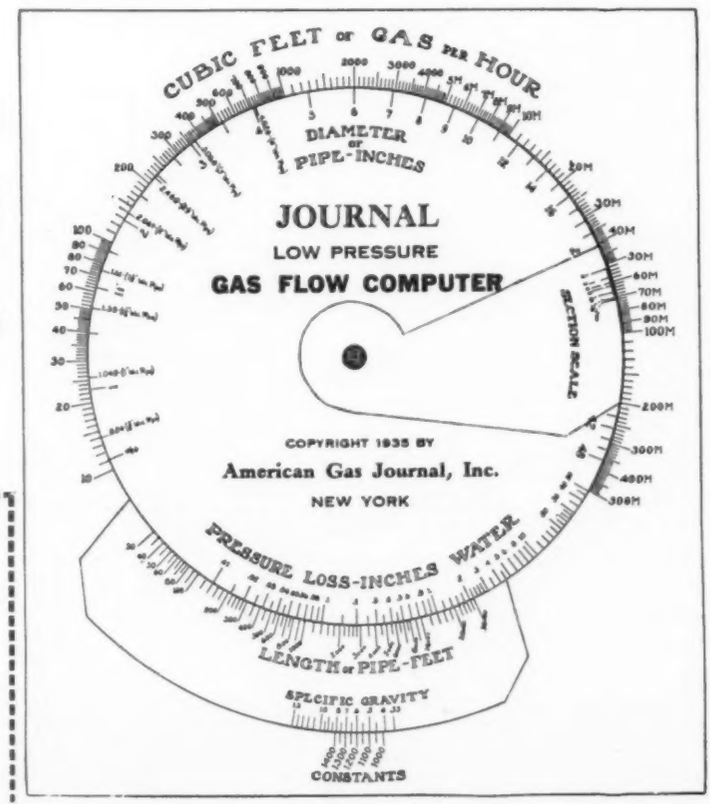

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Book Reviews

Heating, Ventilating and Air Conditioning Guide, 1942 Edition. Published annually by the American Society of Heating & Ventilating Engineers, 51 Madison Avenue, New York, N. Y.

The 1942 edition of the GUIDE contains 1,256 pages and treats exhaustively every phase of heating, ventilating and air conditioning, and related phases of refrigeration. It is bound in a stiff blue cover with gold stamping; and individual copies can be obtained at $5.00 a copy. A thumb-indexed edition is available with chapter tabs at $5.50 per copy for those who desire this particular feature.

In the 1942 edition a new chapter has been added on Fundamentals of Heat Transfer, which includes the basic equations for conduction, convection and radiation. A detailed solution is given for a problem involving all three mechanisms of heat transfer. Some revisions have been made in the chapters on Thermodynamics of Air and Water Mixtures. The Mollier Diagram for Moist Air has been redrawn, and a new Volume Diagram for Moist Air has been added.

The data on Physiological Principles have been revised to include current knowledge on thermal interchanges taking place between the human body and the environment. The chapter on Central Systems for Comfort Air Conditioning has been completely rewritten. Revisions of the chapters on Air Distribution, Air Duct Designs, Sound Control and Fans, provide new data on the design of air handling systems. A new air friction chart, developed at the A.S.H.V.E. Research Laboratory, is included in the chapter on Air Duct Design.

The chapter on Radiant Heating has undergone major revisions and contains data essential for the design of radiant heating systems. A new duct chart has been added to the chapter on Pipe and Duct Heat Losses. In addition, other chapters have been reviewed and revised, which include Combustion and Fuels, Radiators and Convectors, Pipe, Fittings, Welding, Heat Transfer, Surface Coils, Air Pollution, Air Cleaning Devices, Natural Ventilation and Water Supply Piping and Water Heating.

The Catalog Data Section has grown during the 20 years of publication. It has again been revised and gives factual data on the latest types of equipment. Leading manufacturers of heating, ventilating and air conditioning apparatus and materials present their products in five sub-divisions, profusely illustrated and described. Much detailed information is given, including sizes and capacities which enables GUIDE users to determine the suitability of equipment for specific uses.

The GUIDE is now annually procured by more than 10,000 persons.

The Chemical Formulary, Volume V, edited by H. Bennett. The Chemical Publishing Company, Inc., 234 King Street, Brooklyn, N. Y. 676 pages. Price $6.00.

Volume V of the Chemical Formulary contains a collection of valuable, timely practical commercial formulae and recipes for making thousands of products in many fields of industry. All of these are new and are in no sense duplications of those included in other volumes. There is no discussion of theory; the entire book is devoted to actual formulae.

The subjects covered include Food Lubricants, Oils, Materials of Construction, Metals and Metal Treatment, Paints, Paper, Photography, Explosives, Rubber, Plastics, Waxes, Soaps, Cleaners, Etc.

Economic Implications of Public Utility Holding Company Operations with Particular Reference to the Reasonableness of the "Death Sentence" Clause of the Public Utility Holding Company Act, by M. H. Waterman, Professor of Finance, University of Michigan. (Michigan Business Studies, Volume IX, No. 5.) 82 pages. Price $1.00. Orders may be sent to the University Press, 311 Maynard Street, Ann Arbor, Michigan.

This study raises serious doubts concerning the economic soundness of the utility "death sentence" clause. It adduces evidence which denies that the holding company form of organization, per se, fathers social and economic evils, and which explodes the presumptive menace of size.

Will the dissolution of holding companies further the objectives of the Public Utility Holding Company Act, namely, the protection of the consumer and the investor? In answering this basic question, Professor Waterman applies a straightforward technique involving a series of tests of the assumption that the Nation's utility consumers and investors are the victims of holding companies. The answer is found in his comparison of the operations of independent utilities and holding company subsidiaries which reveals that abuses are not essential characteristics of the holding company form. Another significant revelation is that "bigness," as such, whether found in operating units or in holding company systems, is not detrimental to consumers or investors.

The study employs the following tests to determine the reasonableness of Section 11 (b) (1) of the Holding Company Act:

Cost of electricity to consumers
Economy of management
Efficiency in financial management
Protection of utility investors
Effectiveness of utility regulation

The research upon which this publication is based represents the first scientific attempt to test the assumptions upon which holding company regulation has progressed to a climax in the enforcement of the "death sentence" clause.

Trade Standards. Adopted by Compressed Air Institute. (Fifth Edition.) 109 pages 8½ x 11. Price $1.00. Obtainable from Compressed Air Institute, 90 West Street, New York, N. Y.

Late in 1938, Compressed Air Institute issued the fifth edition of its "Trade Standards," which contains a wealth of technical information concerning rotary compressors and vacuum pumps, centrifugal compressors and blowers, compressor accessories, rock drills and pneumatic tools, reciprocating compressors, etc.

Some of the material of particular interest to the gas industry is as follows:

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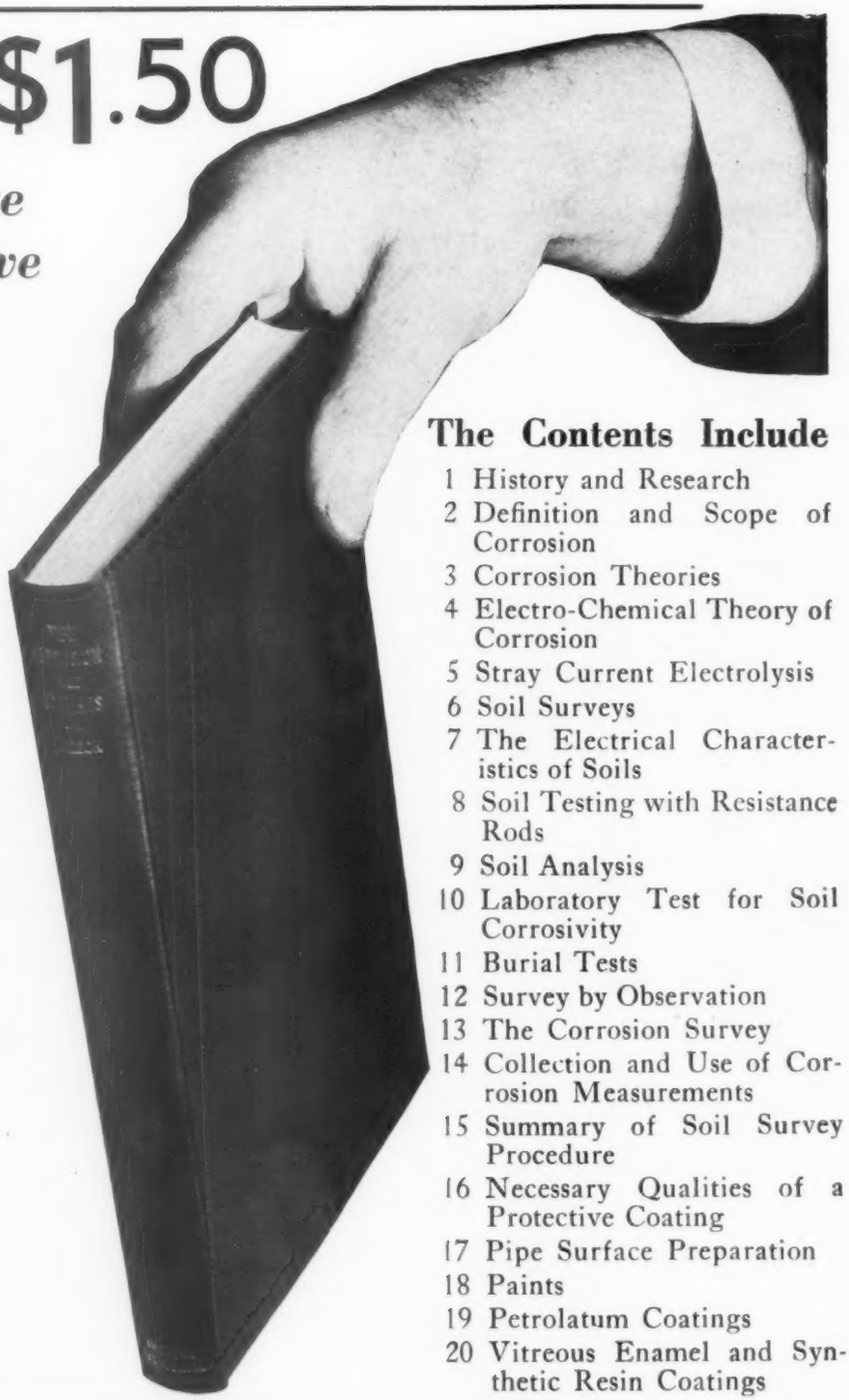

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News of the Gas Industry

New Orleans Public Service Company Explains Use of Safety Devices to the Public By Window Display

Window Display of Safety Tools

To call the attention of the public to the use of safety devices by the employes of the company and by those engaged in defense production industries, the Public Service Company of New Orleans, La., displayed in their windows some fifty-odd tools designed for safety use.

The safety slogan, "Safety—the American Way" was displayed on a semi-circular background, as shown in the picture. On a panel of composition board, cut-out letters indicated the departments, including gas, electric, and all other departments. Before this panel, on a white satin platform, were displayed tools, each attached to a red and white card by a red, white, and blue ribbon. These cards described the tool and explained its safety features. For example—a spark-proof axe was shown with the ribbon leading to a card reading "Spark Proof Tools—Protect the Users in Explosive Atmospheres."

Tools displayed included explosive meters, spark-proof tools, safety shoes, gas detectors, heavy rubber gloves, helmets for fire fighting and welding, construction shields, asbestos helmets, safety cap shoes, and first aid kits for gas operations. For the electrical worker, heavy helmets, rubber clothing, respirators, welder's shield and flame boxes, all rubber shoes, and first aid kits. Each section of the company was represented in the display, each safety device described and explained by its accompanying card and the window stopped thousands of interested passersby.

Institute of Gas Technology Adds Three New Members to Staff

Three men have been named to the staff of the Institute of Gas Technology, Chicago, Ill. They are Dr. Julian F. Smith. Dr. Charles H. Riesz and Dr. R. Lowell Hicks.

The additions bring the Institute staff to 14 persons in addition to the director. The Gas Institute, established just last fall, is located at and affiliated with Illinois Institute of Technology in Chicago, and several faculty members of the latter school assist on the Gas Institute staff.

Dr. Smith has been appointed technical librarian and editor. He has been librarian of the Hooker Scientific Library at Central College, Fayette, Mo.

Dr. Smith was graduated from the University of Illinois, took his master's degree at the University of California and his Doctor of Philosophy in organic chemistry at the University of Chicago.

He reads 13 languages readily and is familiar with patent searches as well as technological library science. As associate director of the Hooker Library, he developed extensive services in translating, abstracting, searching and photocopying. Under his direction similar services of the Gas Institute Library will be made available to member companies. He will also train Institute students in effective use of library facilities.

Dr. Riesz will serve as a research associate, to work with Dr. Vasili Komarewsky, who serves on both the Gas Institute staff and the IIT faculty, on catalysis.

Dr. Hicks will also serve as a research associate, working with Dr. Robert C. Kintner on adsorption. He is a Doctor of Philosophy in organic chemistry from the University of Illinois and had been with the National Aniline and Chemical Company in Buffalo, N. Y.

Federal Power Commission Authorizes Construction of Ten Mile Pipe Line

The Federal Power Commission announced on April 21st its issuance of a temporary certificate of convenience and necessity to the Natural Gas Pipeline Company of America authorizing the company to construct an 8⅝ inch lateral pipe line approximately 10 miles long from its main pipe line in Illinois to a point near Rockford, Illinois, for the purpose of serving natural gas in the Rockford industrial area. The terminus of the new line will connect with facilities of the Central Illinois Gas and Electric Company, and the order announced directs that construction must be commenced by May 1 and the facilities completed within 90 days.

According to the order, the company's proposal and its purchase of necessary materials have received the approval of priority agencies, and it has been granted permission by the War Production Board to make delivery to the extent of 1,000,000 cubic feet of natural gas per day to Central Illinois Gas and Electric Company for use in the Rockford industrial area.

Application for the temporary certificate was filed pending the Commission's determination of the company's application filed February 23, 1942, for a certificate covering all of its facilities, and the order announced April 21st states that the temporary certificate shall cease to have force or effect upon determination of the February 23 application.

Pacific Lighting Corporation Officials Commissioned as Captain and Major

Robert W. Miller, president, and Robert A. Hornby, vice president, of Pacific Lighting Corporation, have been commissioned as Captain and Major, respectively, in the Army and ordered to duty on the headquarters staff of Major Gen. R. G. Cousins, commanding officer of the West Coast Air Corps Training Center. The headquarters are at Santa Ana, California, but their duties will take them to the many training fields of this command located in four states.

Mr. Miller and Mr. Hornby will be granted leaves of absence by the company under its policy of granting such leaves to all employees entering the armed forces. Their duties will be assumed by Mr. C. O. G. Miller, chairman of the board, LeRoy M. Edwards, vice president and general manager, Los Angeles, and executives of the operating companies in Los Angeles. Mr. Miller reported for duty at the end of last month and Mr. Hornby reported on April 11, 1942.

Consolidated Edison Company Reports on Tax Burden

The 1941 taxes of Consolidated Edison Company of New York, Inc., and its System Companies amounted to $1842 for each employee, according to the Companies' annual report to employees.

The employee report, called "Our Company and Our Business—1941," gives a break-down of the average dollar of revenue of Consolidated Edison System Companies during the year, and discusses in simplified terms how they operated as a business.

The report states: "More than 700 of our fellow employees have left their jobs to join the fighting forces. Others have availed themselves of wartime leaves to take jobs in war industries. Because of this, many of us must stand ready to take on any extra work that the emergency requires.

"More than ever we must be on the alert to guard our Company's properties against sabotage. War gives added emphasis to the need for loyalty on the job, a loyalty which will translate itself into every effort to bring about drastic economies in all operations. 'War on waste' to save all essential materials is the order of the day in every Company department."

Under the heading, "The Money Comes In," the report shows that total revenues of $260,214,000 were 1.1% greater than in 1940. In 1941 the System Companies actually took in more money than in any previous year, but taxes increased to a new record so that the net income was less than the year before by 6.9%.

Sales of electricity brought in 79.4 cents out of each average dollar of revenue. Sales of gas brought 15.6 cents and sales of steam 3.8 cents, with miscellaneous at 1.2 cents.

Under the heading, "The Money Goes Out," the report shows that the largest share of each average dollar of revenue went to labor—26.2 cents for wages, salaries and pensions. The tax collectors received the second largest share, 24.2 cents. Coal, materials and supplies took 18.5 cents and depreciation 11.1 cents. Interest on borrowed money amounted to 6.9 cents, leaving 4.2 cents for dividends on the preferred stock, 8.0 cents for dividends on common stock, and .09 cents for surplus. In this connection the report points out that since about $5.00 has been invested in the System Companies to produce $1.00 of annual revenue, this 20 cents for investors represented an annual return of about 4% on the investment.

The total paid by the System Companies for wages, salaries and pensions in 1941 was $78,446,000. Average earnings of weekly employees, including overtime, amounted to $38.85 in 1941, compared with $37.85 in 1940.

The second largest expenditure of the System Companies is taxes—$62,966,000. The report says that in 1941 more than 24 cents out of each dollar of revenue went for taxes, leaving only 76 cents to pay wages, buy materials and meet other costs of running the Company.

Indiana Gas Association Meeting May 11th and 12th

"What we can do for the War program" will share attention with "What's the War program doing to us?" as subject matter for the annual meeting of the Indiana Gas Association in Indianapolis, May 11 and 12. Governor Henry F. Schricker, who is active in the direction of Hoosierdom's civilian defense, and Clarence Jackson, director of the State Chamber of Commerce and the State Council for Defense, will have prominent spots on the program, along with Emmett Cox, of the Indiana Inspection Bureau, who will discuss "Protection of Industry During War Times."

President F. B. Culley, of Evansville, will introduce a number of speakers who will cover every phase of the war effort as applied in the gas industry. "Wartime Appliance Servicing" will be the subject of a symposium, and L. A. Kirch, of Indianapolis, will "Bring us up to date on Substitute Gases." War and postwar problems will be discussed by deans A. A. Potter and J. E. McCarthy, of Purdue and Notre Dame, respectively. Louis Ruthenburg, of Evansville, will cover relationships between the manufacturers, the utilities and the public in these trying times, and William Rowland Allen, of Indianapolis, will speak on war time personnel questions and the answers.

Miss Jessie McQueen, of the American Gas Association, New York, will present a war time nutrition feature. All sessions of the two-day meeting will be held at the Claypool Hotel, Indianapolis.

Servel Refrigerator Used For Blood Storage

The campaign of the Buffalo, N. Y., Chapter of the American Red Cross to build up a "blood bank" in case of emergency, has a competent "worker" in the guise of a Servel Electrolux gas refrigerator.

After the blood is given at a Buffalo hospital, it is shipped to a plant where the liquid is withdrawn and the remaining solids are reduced to powdered form for storage until used. The gas refrigerator is used to protect the blood in the hospital before shipment.

Servel's laboratories in Evansville, Ind., also are making an important contribution to national defense, along similar lines. For some time now, engineers there have been conducting research on the drying of blood plasma for use in connection with transfusions. Technical refrigeration problems growing out of this research are being studied in the company laboratories as an aid to scientists of a Philadelphia hospital, who are carrying on the major project. At the time this was made public by Dr. William R. Hainsworth, vice president in charge of engineering at Servel, he said:

"This emergency situation is bringing strange problems to industrial laboratories and this is one of them. The government is interested in this project and it happens we have the refrigeration research men and apparatus needed for one phase of the problem."

CONVENTION CALENDAR

May

4–7 *Natural Gas Section American Gas Association,* Annual Convention, Roosevelt Hotel, New Orleans, La.

5–7 *A.G.A. Distribution Conference,* New Orleans, La.

11–12 *Indiana Gas Association,* Annual Meeting, Indianapolis.

21–22 *Pacific Coast Gas Assn.,* Technical Section Conference, Ambassador Hotel, Los Angeles, Calif.

25–27 *A.G.A. Production and Chemical Conference,* New York City.

June

4–5 *Canadian Gas Association,* 35th Annual Meeting, Windsor Hotel, Montreal.

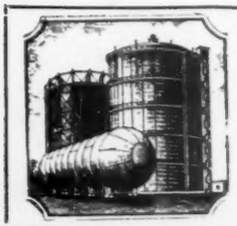
4–5 *Pacific Coast Gas Assn.,* Sales and Advertising Section, Ambassador Hotel, Los Angeles, Calif.

11–12 *Pacific Coast Gas Assn.,* Accounting Section, Ambassador Hotel, Los Angeles, Calif.

September

28 *Pacific Coast Gas Association,* San Francisco.

29th to Oct. 1 *American Gas Association, Annual Meeting,* San Francisco.



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Special Requirements Subgroup Organized to Handle Emergency Problems

Demands resulting from the war production program and ensuing difficulties in obtaining materials and supplies have been responsible for many requests for modification or suspension of certain existing approval requirements under conditions now prevailing. The Approval Requirements Committee of the American Gas Association, headed by C. H. Waring, Superintendent of the Kansas City Gas Company, after full consideration agreed on the need for establishing provisions for prompt handling of such problems. It was decided that a special subcommittee should be appointed to which would be delegated the power to act on matters involving modifications or compromises in current requirements, not affecting safety, that would facilitate war time production.

Headed by Lyle C. Harvey, President of The Bryant Heater Company, this group is known as the Special Subcommittee on Emergency Modification of Requirements. Its size was purposely limited to facilitate holding of meetings and handling of problems requiring immediate decision. It consists of 2 manufacturers and 2 utility company representatives together with the Secretary of the Approval Requirements Committee. In addition, the Chairman of the Working Committee on Housing and Realty Projects of the American Gas Association is an ex-officio member.

Accomplishments of this Special Subcommittee in the brief period of its existence bear witness to the foresight of the Approval Requirements Committee in anticipating the need for its services. In addition to prompt handling of several requests for emergency changes in requirements for various kinds of appliances, this group has also taken the initiative in the preparation of war emergency requirements for gas ranges, requested by the War Production Board. The American Gas Association has been highly commended for its cooperation through the services of this committee by the Board. War emergency requirements for water heaters have also been handled in a similar manner.

Further information regarding this special subcommittee may be secured by addressing R. M. Conner, Secretary, A.S.A. Sectional Committee, Project Z21, A.G.A. Approval Requirements Committee, 1032 East 62nd Street, Cleveland, Ohio.

McClenahan Joins U. S. Army As Major

Mr. R. W. McClenahan, Manager of the Philadelphia Factory of American Meter Company, has been granted leave of absence as of March 27th to join the United States Army as a Major.

It will be recalled that when Helme & McIlhenny and John J. Griffin Factories were combined in 1932 as the Philadelphia

R. W. McClenahan

unit of American Meter Company, he was made Assistant Manager. He was appointed Manager in 1936.

In recent years, Mr. McClenahan has made an intensive study of meter maintenance and performance records, presenting the paper, "Factors and Trends in Meter Maintenance," before the American Gas Association Distribution Conference at Cleveland in 1935.

Fellowships in the Institute of Gas Technology

It's a "lucky thirteen" at the Institute of Gas Technology in Chicago, for Harold Vagtborg, director, has just announced that thirteen college senior students, picked in a nationwide selection, have accepted fellowships from the Institute of Gas Technology.

These thirteen, all of whom have or will receive their bachelor's degrees at the close of the current school year, represent eleven colleges and eight states from all parts of the nation. They will begin their work as fellows immediately upon graduation this spring.

The thirteen, their homes and their schools are:

Willard M. Dow, Edgewater, Colorado, Colorado School of Mines; Roy Chester Feber, Lincoln, Nebraska, University of Nebraska; Alan E. Florin, Chicago, Illinois, Lawrence College; W. Madden Gregory, Nashville, Tennessee, Vanderbilt University; William R. Johnston, Denver, Colorado, University of Texas; Richard A. Nevill, Dallas, Texas, Texas A. & I.; Thomas L. Pelican, Craig, Colorado, Colorado College; Richard A. Rall, Cedar Rapids, Iowa, Coe College; Leonard E. Savory, Denver, Colorado, University of Denver; John W. Selph, Jr., Lawrenceburg, Tenn., Vanderbilt University; Frederick O. Sharp, Jr., Tulsa, Oklahoma, University of Tulsa; Erwin R. Strong, Jr., Kingsville, Texas, Texas A. & I.; Raymond Wynkoop, Jenkintown, Pa., Worcester Polytechnic Institute.

Service From Industrial Rubber Products

The last two of the series of six pamphlets on the subject of "How to Get the Most Service Out of Industrial Rubber Products" has been published by The B. F. Goodrich Company, Akron, Ohio. Titles of these pamphlets are No. 5, "Rubber Hose," and No. 6, "Mats and Matting."

Like the first four of the series, these are furnished free upon request to the company. Titles of the original quartet of pamphlets are: No. 1, "Transmission Belting," No. 2, "Conveyor Belts," No. 3, "V-Belt Drives," and No. 4, "Belt Salvage." Copies of these also can be obtained by writing the company.

Like their predecessors the two new pamphlets treat their subjects in clear, un-

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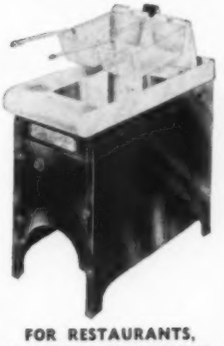

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derstandable language so that any employee of plant or office under whose jurisdiction rubber products fall can easily understand the methods for conserving the precious material now restricted because of the war.

The company suggests that those who receive the pamphlets make copies of the text for distribution among their foremen and maintenance men, or request a sufficient number of copies to supply them. If no number is specified, only one copy will be sent.

Home Service Committee of A.G.A. Offers Bulletin

The Home Service Committee of the A. G. A. presents a new bulletin on the care and correct use of the gas equipment in the kitchen.

In the Plan of Work of the 1942 Home Service Committee, it was planned originally to put out this material in the form of a printed piece that could be passed on by the company directly to customers. As it developed, it was indicated that some companies would wish to use this material in full. Other companies which might already be putting out similar material through their home service departments would wish to use only part of it. Therefore, the committee has set up its report in the form of an Interim Bulletin and in that way each company can use the material in any manner desired to present it to customers.

One sales manager has indicated that he will use part of it each month as a bill enclosure; an advertising manager has said that he will work in parts of it in newspaper advertising and another has indicated that this material will be developed for short newspaper articles. It serves to answer a need that many companies have indicated.

The time and temperature charts on broiling, baking and roasting, included in the material, combine new revisions of the time and temperature material developed by the 1941 Home Service Committee and carried on through a continuing sub-committee with Jane Roberts of the Roberts and Mander Stove Company as chairman.

From the American Gas Association, 420 Lexington Avenue, New York, New York, extra copies of this Interim Bulletin No. 67 are available at 10c each.

Commissions Ease Meter Testing Regulations

The Michigan Public Service Commission on April 6 waived for the duration of the war its rule providing "every domestic gas meter not measuring househeating shall be given a shop test at least once every ten (10) years."

In 1939, the Michigan Commission changed its testing requirement from seven years to ten years. In its ruling, the Commission now states:

"The War Production Board, in reply to a request for priorities on material, has indicated the advisability of curtailment in so far as possible of such work for the duration of the war.

"The waiving of this rule is for the express purpose of saving as much essential material for the war effort as possible and is not to be interpreted as relieving the utilities of the obligation of making necessary tests. Neither does it in any way affect the periodic testing of any meters except those specifically included under subsection (a), and each utility should bear in mind that upon the termination of the war, they will be expected to bring their domestic meter testing work up to date within a reasonable time."

The Maryland Commission has enlarged for two years the meter testing period.

Boone County Coal Corp'n in New Quarters

The Boone County Coal Corporation announces the removal of its Philadelphia office from 1608 Walnut to 1528 Walnut Street.

W. H. Gignilliat, Major in Army Air Corps

William R. Gignilliat of Birmingham, Ala., has resigned his position as vice-president of the Southern Natural Gas Company to accept a commission as a major in the United States Army Air Corps. During the first World War, Major Gignilliat served as captain.

Ak-Sar-Ben Natural Gas Co. Sold

Reece McGee of McCook, Nebraska, president of the Ak-Sar-Ben Natural Gas Company, announced April 11 the sale of his company's properties in Nebraska to the Kansas-Nebraska Natural Gas Company of Phillipsburg, Kas., of which L. E. Fisher of Chicago, is president.

The Kansas-Nebraska company now owns 1,100 miles of pipe line serving 25 communities in Kansas and 65 in Nebraska. Its territory extends from Ogallala to York and Exeter. The gas is supplied from the Hugoton, Kas., field.

The Ak-Sar-Ben company owned lines and distribution systems in the Republican valley area from Minden to McCook.

Mr. McGee, who has served also in an executive capacity with the Kansas-Nebraska Company, will continue his association with the firm as a construction contractor.

E. R. Meade Elected Vice-President Atlanta Gas Light Co.

E. J. Meade, president of the Roanoke Gas Company, Roanoke, Va., has been elected vice-president of the Atlanta Gas Light Company and the Florida Public Utilities Company. He succeeds Eugene J. Stern, who resigned recently to become president of the Scripto Manufacturing Company.

Mr. Meade has served with the Kirk Gas and Smelting Company of Iola, Kans.; the Oklahoma Natural Gas Company and was district manager of the Texas Public Service Company of San Angelo. He was president of the Roanoke Company for two years.

Gas Heated Galvanizing Kettles

One of the largest gas-fired galvanized kettles in Canada is in the new plant of Dominion Rustproofing Company, Vancouver, B. C. Here the advantages of gas for industrial firing have again been recognized.

Twenty-two feet long, forty inches wide and forty inches deep, the huge kettle is constructed of inch and a quarter fire-box steel with a capacity of about fifty tons of molten zinc. The kettle is capable of turning out 16 tons of zinc coated steel per eight-hour shift.

Final decision to install gas firing for the kettle was reached only after comparative study indicated gas to be the most practical fuel for the purpose. With the use of gas the useful life of the kettle is extended from approximately two years when heated with other fuels to approximately six years.

With gas, a constant temperature of 850 degrees Fahrenheit with a variation of but one degree is maintained. This control eliminates over and under heating, prevents over heated zinc from reacting with the metal of the kettle itself and prevents "freezing" of the zinc. Installation of the galvanizing kettle was supervised by the B. C. Electric industrial gas engineers.

R. J. Organ and H. J. Carson Directors Northern Natural Gas Co.

Conversion of the Northern Natural Gas Company from a holding company property to a publicly-owned company was advanced at a meeting held in Omaha, Neb., when two holding company directors were replaced.

H. J. Carson, operating vice-president, and R. J. Organ, general counsel both of Omaha, were elected directors in place of two who represented the United Light & Railways Company. Both have been with the company since 1930, the year it was organized.

Northern Natural Gas stock has been owned 35 per cent by United; 35 per cent by North American Light & Power Company and 30 per cent by Lone Star Gas Corporation.

Under the holding company act, SEC ordered United to sell its stock, which was done last September. North American is in the process of selling and Lone Star is expected to sell soon.

Directors representing these companies will then be replaced. B. R. Bay, president of the company, is the seventh director.

Otto Elected Vice-President

Judge Robert W. Otto, former member of the Supreme Court of the State of Missouri and Former Attorney General, was elected Vice-president of The Laclede Gas Light Company March 13, 1942, by the Board of Directors. Judge Otto recently was elected a member of the board.

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Service Engineer

Desires position offering chance for advancement. Thirty-seven years of age, 18 years' experience in distribution department. Can instruct in the services of all appliances and househeating on either natural or artificial gas. Address reply, Box 122, c/o AMERICAN GAS JOURNAL, 53 Park Place, New York City.

War Production Board

Order L-31 Extended

(Continued from page 47)

Restrictions on the delivery of natural and mixed natural and manufactured gas to consumers, as provided in order L-31 issued February 16, 1942, have been extended to parts of six midwestern states. Order dated April 23rd.

New areas brought under the restrictions are PARTS of Iowa, Kansas, Minnesota, Nebraska, Oklahoma and South Dakota.

After May 15 no utility may deliver natural or mixed gas to new non-residential consumers in those areas or increase deliveries to existing non-residential consumers unless such consumer installs standby facilities to replace the new or additional delivery during a period of shutoff, or unless such delivery is approved by the WPB.

After May 15 no utility may deliver natural or mixed gas for the operation of a gas heating system unless such equipment was installed prior to May 15 or unless, in the case of new construction, the gas-heating equipment was specified in the contract and the foundation under the main part of the structure in which the equipment is to be installed was completed prior to May 15. The prohibition also applies to gas heating equipment which has been converted from other fuel to natural or mixed gas unless conversion takes place prior to May 15.

Paragraphs (d) and (e) of Limitation Order L-31 have also been amended. Complete order number 983-WPB.

T. J. REYNOLDS

Thomas J. Reynolds, Secretary-Treasurer of the Geo. D. Roper Corporation, died suddenly at his home in Rockford early Thursday morning, April 16. Mr. Reynolds was born in Rockford July 18, 1888. Educated in the Rockford schools, he went to work for the Geo. D. Roper Corporation December 1, 1910, at the old Roper plant. He progressed rapidly. From clerk in the Purchasing Department he advanced to Assistant Purchasing Agent in 1915 and to Purchasing Agent in 1917. In 1929 he became Secretary-Treasurer of the

Company. In addition to carrying out his duties with Roper, he also acted as Assistant Secretary-Treasurer of the Blackhawk Engineering Company, Roper subsidiary whose production is devoted exclusively to Army Ordnance.

Tom Reynolds was well known and well loved by all Roper employees. He was prominent not only in Rockford industrial circles but also in many outside of the city. His friends in the Gas industry were countless. He was a Master Suppler and a charter member of the Guild of Ancient Supplers.

Natural Gas Industry and The War

(Continued from page 11)

what they now call by the fashionable word "morale," is the worst of all possible mistakes. We are glad that our government realizes this and takes such elaborate pains to prevent it.

I think that the desire to know and the human tendency to suspect and to imagine and to make things up, are responsible for whatever is not satisfactory in American morale at the present time. That every American loves his country devotedly and would go to Hell for its preservation, I think, is beyond question, but merely "going to Hell" for our country is too vague an estimate to put upon the amount of effort and the kind of effort and the duration of the effort required to win this war.

There is even uncertainty as to just what "winning the war" will consist of. We know that we had a great and glorious country. It was great and made glorious by certain well-known and familiar means. If that country or those methods of making our country are in danger, we will fight; in fact, we are fighting. It is also a fact established in every American's mind that this, being the industrial kind of country that it was, made possible the war for its preservation—and nothing else did or could. Hence, there is a very natural and general desire to know that war will not lose us that freedom of American industrial economy which is part of every American's birthright.

War times, and all times hereafter, although to a less degree, require the closest co-operation between our industry and the Government. I know that those among us who have come into the closest contact with the present administration in Washington, and therefore can speak with the greatest knowledge, are the most confident that the Socialism bogey need not disturb the American people. I am heartily in favor, as a positive, aggressive war measure, of the most active steps possible toward making this universally known in this country. The means for making it known undoubtedly exist in Washington, and I have no doubt that the same wise measures will be taken in this regard that are taken in all others.

Presented before the Spring Meeting-Eastern District American Petroleum Institute Division of Production, Pittsburgh, Pa., April 9, 1942.

Natural Gas Cycling

(Continued from page 41)

paraffin developments. The new Clarkiron Process recently announced (9) once more used the dry byproduct natural gas of the cycling industry as a reducing agent in the reduction of various ores.

The cycling industry with large investments in many plants operating efficiently and after a fashion making possible the greatest conservation of petroleum products to date will be rewarded for such efficient operation, now and even more so in the future, by an ever increasing demand for its products and its byproducts.

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Iron Men and Their Dogs by Ferdinand C. Latrobe.

This interesting book of historic value describes the origin, growth and activities of the Bartlett Hayward Division of the Koppers Company. Although it was prepared primarily for the employees of the company, it is a real contribution to the general literature of the gas industry.

"This story of the progress of 'Iron Men and Their Dogs,' portrays the growth of 'Bartlett-Hayward' from cook stoves to massive reclamation project castings, from cast-iron to an epoch-making high tensile bronze, from domestic water heating boilers to gigantic modern gas holders and, as Baltimore auctioneers comprehensively declare, 'other genuine articles too numerous to mention.' All its progress has been under the talisman of two cast-iron replicas of the primogenitors of the Chesapeake Bay Dog."

Several chapters of the book are devoted to the association of the company with the gas industry and the important part it has played in the construction of gas holders and other gas works equipment. Many of the photographs are of interest and will form an important permanent record.

Home Volunteer Movement Program Provided for Utilities

A Home Volunteer movement which gas companies throughout the country may utilize to assist homemakers in their communities to cooperate effectively and intelligently with the government's Consumer Conservation Plan and its National Nutrition Program, has just been launched.

The movement, which has gas companies of the nation as the energizing force behind it, will give individual gas companies an opportunity to use their trained personnel, their special facilities and their experience in the fields of foods and nutrition, as well as in general home conservation.

Servel, Inc., at the suggestion of a number of gas companies, has developed the proposed program, with the guidance and advice of government officials and nutrition experts.

The nationwide movement is a "spontaneous" endeavor by the gas industry to help women of the land mobilize their homes for the war effort, so that they may render the greatest possible service to the government in its campaigns of health and nutrition on the Home Front.

To this end, the whole project has been geared to show them how to apply in their own homes the principles of conservation and nutrition recommended by the government, in its efforts to conserve the economic strength of the nation, and build the health of its people.

To help gas companies bring the Home Volunteer movement to the attention of their customers, the Consumer Service division of Servel has prepared and offers the following service and materials:—

Newspaper Advertising: For use in local newspapers, Servel will furnish complete mat services on the Home Volunteer movement. These advertisements will be keyed for announcing the Nutrition Guide, The Home Volunteer's Defense Manual, and other materials.

Radio Advertising: Radio scripts are also being provided on the Home Volunteer movement for use in spot announcements on local stations.

Direct Mail: A gas bill enclosure has been prepared for mailing with customers' monthly statements.

The gas industry has been characterized by government officials as the first channel to come forward with a complete program interpreting the government's nutrition and conservation programs to homemakers and showing them how to put them into effect.

JOINTS that don't require skilled workmen

LET TRAINED HANDS do work that will help to win the war. They are not needed in the construction of a mechanical joint cast iron pipe line. Any able-bodied man without previous experience can quickly become expert in assembling the bottle-tight mechanical joints made by C. I. P. R. A. members. They vary in design but are based on the same time-tried principle and all are bottle-tight under all operating pressures.

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